



The AI Contributions to Criminal Justice System Advancement

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Abstract:

The global shift towards digitization, driven by technological advancements like artificial intelligence, has revolutionized human life but also posed challenges for law enforcement and judicial systems.

To address this issue, some communities propose integrating AI technologies into the criminal justice system. This involves developing tools that use AI to detect and monitor criminal activities, aiding the judicial system and security agencies in mitigating the risks associated with such crimes. This approach aims to improve the efficiency and effectiveness of law enforcement and judicial systems.

Keywords: digitalization, justice, AI, development, efficiency, contribution, ...

I. INTRODUCTION:

In the past few decades, society has experienced remarkable progress in information and communication technologies, alongside significant advancements in digital technologies. These innovations have influenced numerous facets of life, including health, education, and social interactions, among others. Additionally, the legal sector has reaped the benefits of these technological advancements, which are designed to optimize the operations of the judicial system, ultimately aiding judges in executing their responsibilities with greater efficiency.

One of the most important contemporary technologies is referred to as "artificial intelligence," which has emerged as a leading topic of discussion and a key highlight among recent developments in the digital landscape. Historians view it as a crucial catalyst that has shifted society from the industrial revolution into the age of technology and digital information. This technology is deemed the most sophisticated of our era, with the potential to significantly improve human life in numerous areas, including the legal sector.

Artificial intelligence is characterized as a sophisticated technology that allows digital systems to demonstrate reasoning and capabilities akin to those of humans, including analysis and autonomous decision-making on particular matters. This functionality is accomplished through the processing of extensive training data. Throughout this analytical journey, artificial intelligence acquires the ability to understand speech, detect patterns and trends in real-time, address problems proactively, and forecast future scenarios and occurrences (SAP, 2021).

Artificial intelligence presents a wide array of benefits, particularly its exceptional capacity to perform programmed functions and streamline intricate processes. Numerous AI-based systems are capable of analyzing extensive datasets at speeds that far surpass human abilities, thereby freeing up valuable human resources to focus on more impactful activities. This enhanced efficiency results in considerable gains in productivity, allowing employees to allocate their time to critical strategic decisions and innovation instead of mundane tasks. As a result, this notion has infiltrated many areas of human existence, especially within the realms of legal work and criminal justice.

In light of the earlier conversation, a crucial problematic emerges for us as professionals in the field of criminal justice:

To what degree does the integration of artificial intelligence contribute to the improvement of the criminal justice system and judicial procedures?

The importance of investigating this subject stems from the reality that this technology embodies the most sophisticated and notable advancement of our era, enabling individuals to execute their responsibilities with greater efficiency and precision.

Our study aims to:

- Clarify the legal framework governing the use of artificial intelligence systems.
- Assess the feasibility of utilizing artificial intelligence in judicial investigations.
- Explore the role of artificial intelligence in enhancing the criminal justice system.

To explore this topic, we have structured our study into two sections. **The first section** will focus on the application of artificial intelligence in the substantive aspects of criminal justice, while **the second section** will address the procedural dimensions of utilizing artificial intelligence within the realm of criminal justice.

1. The objective aspects of AI in the criminal justice field:

The term artificial intelligence is one of the most significant concepts in the realm of advancements in information and communication technologies in this era, and it is indeed the most advanced among them as another, however, strong technological wave that is flattening the world (Ergen, 2019, p.5)

Consequently, AI has been used by humans across various aspects of life, including by legal professionals to enhance criminal justice (Sahat et al., 2024), which will be explored in this discussion.

The incorporation of artificial intelligence into the criminal justice system started with the creation of fundamental data analysis tools that helped law enforcement agencies recognize crime trends. As technology progressed, innovations in machine learning, natural language processing, and big data analytics have resulted in more advanced applications.

Currently, AI plays a significant role in multiple facets of criminal justice, such as predictive policing, which employs data-driven algorithms to anticipate criminal behavior and optimize resource allocation, and facial recognition, which utilizes cutting-edge image processing methods to identify suspects and locate missing individuals (Benarfa, 2024).

1.1 The use of AI in predicting future criminal activities:

The safety of a community is of utmost importance, which necessitates that governments implement effective measures to lower crime rates. As a result, the use of artificial intelligence (AI) for crime forecasting has emerged as a crucial and extensively studied field (Dakalbabb et al., 2022, p.1).

In recent years, numerous countries and various legal frameworks have witnessed the application of artificial intelligence in crime prediction and location analysis (Aafrin & al., 2024).

Crime prediction refers to the ability to anticipate the occurrence of criminal activities before they actually take place, enabling authorities to implement necessary measures and preventive strategies to combat and deter such incidents, but attempting to predict crime manually would be difficult (Dakalbab & al., 2022).

This technology serves as a clear example of traditional methods aimed at thwarting and suppressing crime, as well as disrupting the plans of individuals with significant criminal potential (Bouamra, 2024, p.189) before they can act.

Innovative methods are primarily used to predict crimes, including the following:

A- Data Analysis:

Crime data is uploaded digitally, and reports are submitted electronically through smart applications linked to the judicial authorities responsible for law enforcement (Kirsanova et al., 2021). This information is updated regularly, initiating the process of gathering details about suspects and the individuals filing reports.

The collected data is then analyzed and compared with existing digital systems, significantly enhancing the speed and efficiency of processing reports and investigations compared to traditional methods (Bouamra, 2024, pp.193-183).

As the use of this technology has evolved, legal professionals have recognized that its success rate is not guaranteed to be 100%. Numerous reports from various organizations indicate that the effectiveness of crime prediction systems largely depends on the quality of the data utilized and the ethical considerations surrounding its use (Youngsub et al., 2024).

If the data employed is tainted by social or racial biases, these systems may inadvertently perpetuate those biases when applied improperly, resulting in unfair outcomes (Ankis, 2024, p.4).

Crime prediction systems have been implemented globally in cities such as Los Angeles and London, where they have demonstrated effectiveness in reducing crime rates in specific areas.

For instance, a study conducted by the Metropolitan Police in London revealed that the use of predictive artificial intelligence systems has enhanced police response to crimes and led to a reduction in crime rates in sensitive neighborhoods by as much as 31% in certain cities and districts (Ankis, 2024, p.4).

Through these studies, it becomes evident that artificial intelligence possesses significant potential to enhance the criminal justice system. It aids in addressing criminal cases and enables justice sector professionals to perform their duties more efficiently, allowing for rapid responses that transcend traditional time and space constraints.

Additionally, AI empowers these professionals to identify both emerging and advanced methods employed in contemporary digital crimes, as well as those related to media

and communication technologies, alongside traditional criminal activities (Bouamra, 2024, p.194).

The effectiveness of crime prediction has been enhanced through the analysis of data by artificial intelligence. However, the implementation of these systems has faced significant criticism due to concerns regarding racial biases inherent in their use, which can lead to outcomes that are far removed from fairness and integrity.

B- Face ID technic:

The technology behind Face ID represents a pinnacle of our hardware and software innovation. Utilizing the TrueDepth camera, it gathers precise facial information by projecting and assessing thousands of invisible dots, which form a detailed depth map of your face, while also capturing an infrared image for enhanced accuracy (N.O, 2024).

Technological advancements have significantly enhanced the methods used in crime investigation and the identification of offenders. One of the most notable developments is facial recognition technology, which has a wide range of applications in identifying suspects at airports and border crossings, as well as in the issuance of identification documents. Additionally, this technology is employed by law enforcement agencies during patrols to locate fugitives who are wanted by the justice system and for whom the police have prior photos (Medini, 2024, p.249).

This advanced technology can be employed to identify suspects through surveillance cameras in large gatherings, allowing for distant observation from various angles. It is supported by identity verification software that offers a reliable mechanism for this purpose. Additionally, it aids in detecting potential suspects and accelerates screening processes by integrating electronic systems with artificial intelligence, thereby providing precise security indicators (Bouamra, p.195).

Facial recognition systems, often referred to as facial biometrics, are among the most significant emerging technologies that primarily utilize artificial intelligence for monitoring and tracking suspects. These systems employ complex algorithms to analyze and match human facial features, enabling precise identification of individuals based on this analysis (Alley & Abdelmadjid, 2023, p.388).

The use of this technology is increasingly prevalent in various countries, aimed at enhancing public safety and combating crime and its perpetrators. Among these nations, China stands out as a leader in the widespread implementation of this system, having integrated facial recognition technology into public surveillance cameras across many of its major cities (Ankis, p.5).

The use of facial recognition systems in various countries, similar to other artificial intelligence technologies, has raised significant concerns regarding individual privacy and human rights.

For instance, in the United States, these systems have been extensively deployed in airports and public spaces to identify suspects and wanted individuals. However, they have faced substantial criticism due to the lack of legal regulation in this area, as they operate without individuals' consent, which many perceive as a violation of personal privacy.

Additionally, some critics argue that these systems may exhibit racial bias, potentially leading to wrongful and unjust arrests of certain racial groups (Bouamra, p.196).

C- Digital forensic analysis:

Digital forensics is a specialized field within forensic science dedicated to the identification, acquisition, processing, analysis, and reporting of electronically stored data. This type of evidence plays a vital role in nearly all criminal investigations, making digital forensics support essential for law enforcement agencies (Interpol, 2021).

Evidence can be gathered from a diverse range of sources, including computers, smartphones, cloud storage, drones, maritime equipment, and beyond. The primary objective of digital forensics is to retrieve data from electronic evidence, transform it into usable intelligence, and present the results in a manner suitable for legal proceedings. All

methodologies employed adhere to rigorous forensic standards to ensure that the findings are valid and can be accepted in court.

It is also one of the modern techniques associated with artificial intelligence. It is defined as a process that connects forensic science with computer science and digital networks by utilizing modern electronic devices such as computers, along with the internet and digital media. In light of rapid technological advancements, this approach enables the generation of digital evidence related to criminal incidents that have occurred.

This process has been applied to all data accessible to the judicial authorities responsible for law enforcement and application, including lists of suspects and individuals reported in other cases, as well as information from various sources such as their health and social data. The primary aim of this digital technique is to preserve, identify, and easily retrieve digital evidence at all times, ensuring it is documented for potential use in court when necessary (Bensaoud, 2024).

These systems are noteworthy for their ability to analyze vast amounts of data more quickly and accurately than humans can. This data encompasses written texts, videos, and audio recordings. By leveraging artificial intelligence, these systems can uncover evidence that may be hidden or difficult to detect through conventional methods. Their capacity to handle large volumes of data makes them an invaluable tool for criminal investigators, especially when dealing with complex cases that necessitate a thorough analysis of diverse types of evidence (Ankis, p.7).

D- The use of intelligent robots for crime investigation:

Criminal activities undermine the peace and security of society, prompting both governments and individuals to actively combat and reduce crime. It is evident that communities have established systems for addressing crime, which include mechanisms for justice and the prosecution of offenders (Al-Batati & Al-Khald, 2024).

A critical aspect of these post-crime processes involves the interrogation of suspects and the questioning of witnesses. However, these interrogations can be time-consuming and labor-intensive, necessitating a high level of expertise from those conducting them. In response to these challenges, we propose an innovative solution that incorporates robotics into the interrogation and questioning process. Our design could be effectively utilized in various settings, such as police departments, educational institutions, airports, and any other environments where human interaction and inquiry are essential for security or criminal investigations.

Recently, several advanced countries have begun employing intelligent robots powered by artificial intelligence to investigate crimes and identify suspects. This shift is largely due to the robots' exceptional accuracy and rapid analytical capabilities. Additionally, these robots possess the ability to interact with individuals and provide in-depth responses to their inquiries regarding the committed crime (Alley & Abdelmadjid, p.393).

As an example in this field, the Dubai Police announced in 2017 the launch of the first artificial intelligence robot in the Arab region, aimed at raising awareness about the dangers of drug consumption in a highly innovative manner. Meanwhile, China has initiated several experimental projects in the realm of robotic policing, where robots patrol public areas to identify and address potential threats. However, this initiative has yet to gain recognition from many countries due to its high costs (Bouamra, p.195).

1.2 The significance of employing AI in the advancement of criminal justice methods:

The integration of AI technologies within criminal justice systems has been motivated by the demand for improved crime detection and prevention strategies, more effective allocation of resources, and enhanced decision-making capabilities (Situmeang et al., 2024, p.1967).

For example, predictive policing algorithms are employed to anticipate criminal behavior, while machine learning models play a crucial role in assessing risks during sentencing and parole evaluations (Angwin et al., 2016). However, the incorporation of AI in

this field also brings forth important ethical, legal, and social issues, especially concerning bias, transparency, accountability, and the risk of misuse.

Artificial intelligence is the most advanced term of our time, demonstrating its ability to enhance human life across various fields due to its precise data analysis capabilities. This is equally true in the realm of criminal justice, where this technology holds significant importance.

2.1 Preventive crime detection:

The evolution of technology has led to a rise in the complexity of criminal activities. In response to this growing sophistication, both law enforcement agencies and the private sector need to adapt by leveraging technological advancements, including artificial intelligence (AI), to improve investigative processes and boost their success rates (Jarrod, 2024).

From the viewpoint of law enforcement, AI serves as a significant asset in the realm of criminal investigations. It can facilitate the analysis of social media interactions and assist in the identification of faces, voices, and behavioral patterns, thereby helping to uncover trends related to organized crime and various other offenses.

The advanced detection of crimes is achieved through the use of artificial intelligence systems that employ smart surveillance, analyze recorded crime data, assess individuals' emotions and behaviors, and identify potential crime hotspots. Furthermore, this system monitors individuals classified as having a high risk of aggression, recognizing that criminals exist in various categories rather than being uniformly dangerous.

In addition to the numerous advantages offered by artificial intelligence technologies in crime prevention, there are several proactive measures that can be implemented. These include monitoring suspicious individuals, suspects, and those with criminal records, as well as tracking their movements and activities to mitigate potential threats.

Furthermore, AI can assist in identifying crime hotspots, recognizing frequent visitors to these areas, and observing broader criminal trends to pinpoint their origins and timing. This process relies on accurate data recorded in official records, which is enhanced by digital AI technologies and modern technological tools (Medini, p.195).

2.2 Enhancing security operations and facilitating judicial processes:

This process involves the analysis and processing of data and information within the context of crime investigation. The system conducts searches and inquiries within data repositories in the digital realm and various information systems, utilizing specific methodologies and technologies relevant to the security field.

The goal is to generate effective security recommendations and plans that facilitate informed and precise decision-making prior to the occurrence of a crime. As security technology advances, the effectiveness of the decisions and outcomes derived from the intelligent system increases, thereby contributing to a reduction in crime rates and proactive measures against potential criminal activities (Noura & Mohammed, 2023, p.735).

2.3 Reducing emerging crimes:

As previously mentioned, the world is experiencing significant advancements, including in the realm of crime. Therefore, it is essential to implement artificial intelligence systems for effective crime prediction and to identify emerging criminal activities before they manifest. This proactive approach can help mitigate their severity and enable a more effective response, ensuring the safety of communities (Medini, p.250).

Consequently, it is crucial to promote the use of artificial intelligence technologies within the judicial and security sectors to reduce and prevent new criminal phenomena. This strategy not only simplifies the process but also alleviates the overall burden of crime, shifting the focus from merely responding to incidents after they occur to preventing them in the first place (Bouamra, p.192).

2. The procedural aspects of AI in the criminal justice field

The evolution of the criminal justice system influenced by artificial intelligence extends beyond just substantive aspects; it also impacts procedural elements, particularly in the realm of criminal investigations. In this section, we will highlight the key components of the criminal justice process that have been affected by AI, while also exploring the legal regulations that govern the use of this technology.

2.1 The application of AI in investigative and forensic work:

Recent advancements in forensic investigation have emerged in various fields through the application of artificial intelligence systems and technologies. In the following discussion, we will explore the most significant areas and their respective applications.

A- The application of artificial intelligence in investigative and analytical tasks:

Artificial intelligence systems represent some of the most advanced tools available for conducting investigations and research. Many crimes that involve modern technologies are challenging to prove and trace, necessitating the use of sophisticated techniques in the investigative process.

AI has demonstrated effectiveness in this area, as these systems possess a remarkable and precise ability to yield investigative results and insights into criminal activities without human intervention. Consequently, they provide highly accurate and specific outcomes that aid in identifying the perpetrators of these criminal acts (Rai, 2023, p.170).

Artificial intelligence technologies play a crucial role in combating emerging crimes that also utilize advanced techniques for their execution. This alignment allows for a more effective response to such crimes through the application of similar or even more sophisticated technologies during investigations (Adjmani & Sayed, 2023, p.614). Notably, some of the most prominent AI-driven innovations include the use of intelligent robots and autonomous vehicles (Mimouni & Ammari, 2024, p.168).

B- The application of artificial intelligence in the field of criminal investigation:

The investigation process is a crucial phase in criminal proceedings; however, this profession has become increasingly challenging due to the technological advancements employed in the realm of crime today. In response, some leading countries in artificial intelligence technology have proposed the idea of utilizing an automated investigative judge that leverages AI techniques to assist human judges in their investigative tasks.

This approach aims to analyze information with high precision, identify sophisticated criminals, and gather sufficient evidence against them, ultimately facilitating their prosecution and reducing the prevalence of such crimes (Mimouni & Ammari, p.70).

2.2 Guidelines for the Use of Artificial Intelligence in the Criminal Justice Sector:

The use of artificial intelligence technology presents a double-edged sword; improper application can lead to biased and unjust outcomes against those it targets. Therefore, the implementation of this advanced technology in the field of criminal justice must be accompanied by several safeguards, which we believe should include the following:

- Ensure the intelligent system operates correctly and is fortified against breaches that could disrupt its functionality.
- The system's results should not be relied upon entirely.
- Verify the accuracy and integrity of the data input into the system to ensure that the outcomes are fair and free from bias or discrimination. Any flaws or biases in the data will lead to similarly flawed results, distancing the judiciary or law enforcement from achieving a just verdict (Djaloud, 2023, p.174).
- The artificial intelligence should be programmed to document the investigation and its findings, allowing judges to reference it based on their personal judgment. Additionally, it should be accessible for review, enabling judges to verify any uncertainties and make informed decisions (Djaloud, p.172).

IV. Conclusion:

In conclusion, this research document highlights that the application of artificial intelligence in the field of criminal justice has become feasible in today's era due to advancements in technology. These developments assist both law enforcement and judicial systems in their efforts during crime investigation and inquiry.

Various technologies, such as crime prediction systems, have demonstrated their effectiveness in several leading cities. Additionally, the deployment of intelligent robots in the search for criminals and in the interrogation process enhances the ability to identify crime hotspots, enabling police officers to respond promptly.

However, this technology has not been without its critics. While some advocate for its implementation, others oppose it, citing concerns over the risk of biased and unjust results if it is not applied correctly. Given these considerations, we can suggest the following recommendations:

Recommendations:

- ✓ Establishing specialized organizational committees focused on judicial work and artificial intelligence technologies to oversee their application within the field.
- ✓ Enhancing the skills of judicial police officers to equip them for addressing modern security challenges that utilize artificial intelligence techniques.
- ✓ Developing a dedicated legal framework that encompasses both the substantive and procedural aspects of using these systems, including deterrents against their misuse.
- ✓ Implementing security strategies for early crime detection and prevention by allocating resources based on predictive data from artificial intelligence, such as increasing patrols in areas identified as high-risk for crime.
- ✓ Fostering collaboration between higher education, research institutions, and state security authorities to create intelligent systems and programs for crime detection.
- ✓ Creation of a comprehensive higher education program that integrates criminology and artificial intelligence, training specialists proficient in both fields.

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