The Role of Artificial Intelligence in Ensuring Fair Criminal Proceedings in Iran: Capacities, Challenges, and Regulatory Requirements

1. Maryam Reyshahry🆔: Department of Law, Na.C., Islamic Azad University, Najafabad, Iran
2. Amin Amirian Farsani🆔*: Department of Law, University of Gonabad, Gonabad, Iran
3. Mehdi Jalilian 🆔: Department of Law, Na.C., Islamic Azad University, Najafabad, Iran

*Correspondence: amirian_farsani@gonabad.ac.ir

Abstract

The expansion of artificial intelligence over the past decade has transformed the structure of many legal and criminal justice systems and has ushered discussions of fair trial guarantees into a new phase. Characteristics such as processing speed, high accuracy, large-scale data analytics, and learning capabilities have led to the deployment of artificial intelligence across all stages of the criminal justice process—from crime detection, preliminary investigations, and evidentiary analysis to case management and even risk assessment for recidivism. Within Iran's criminal justice system, the Judicial Transformation Document emphasizes the intelligent use of emerging technologies in the service of justice. Despite demonstrable benefits—such as reducing delays in proceedings, minimizing human error, enhancing law enforcement efficiency, improving evidence identification processes, enabling digital forensic medicine, and increasing transparency—the use of artificial intelligence also entails serious risks. These include the potential amplification of racial and socio-economic biases embedded in training data, violations of privacy, the opacity of algorithmic decision-making, the erosion of judicial independence, and threats to the right to a fair trial. Employing a descriptive–analytical method, this study examines the capacities and challenges of artificial intelligence in Iran's criminal proceedings. Through an analysis of international human rights instruments, such as the European Declaration on Digital Rights and Principles (2022), it argues that harnessing the benefits of artificial intelligence is compatible with the principles of criminal justice only when accompanied by a rigorous framework of oversight, transparency, accountability, and anti-bias safeguards.

Keywords: Artificial intelligence; criminal procedure; criminal justice; algorithmic bias; privacy.

1.   Introduction

Today, artificial intelligence (AI) affects most aspects of human life. This influence can be attributed to the remarkable speed and accuracy of AI in processing large volumes of data within a short time, which in turn increases the speed and precision

of performing various human tasks. Artificial intelligence refers to systems that possess the capacity to exhibit reactions similar to intelligent human actions, such as understanding complex situations, simulating human thinking processes and reasoning methods, responding effectively to them, learning, and acquiring knowledge and reasoning capabilities to solve problems. In simpler terms, artificial intelligence denotes the type of intelligence that a system demonstrates across different situations. One of the domains in which artificial intelligence has been applied is the criminal adjudication process. The speed and accuracy of AI, while reducing delays in judicial proceedings, also minimize the harms arising from human error in the adjudicative process (Sharma et al., 2024). Moreover, the maximum utilization of emerging technologies and artificial intelligence in judicial review and in the issuance of judicial decisions and rulings is among the issues emphasized in Iran's Judicial Transformation Document. The capabilities of artificial intelligence—particularly its high speed and accuracy in processing large datasets and reducing the time required for judicial operations—have led to its application in adjudication, especially in the context of fair and impartial criminal proceedings.

The ultimate goal of justice, along with the mechanisms and methods for achieving it—such as ensuring fair and impartial proceedings—has always constituted immutable values and norms within national and international legal systems. A comparative analysis of past and contemporary periods indicates that traditional methods of adjudication, due to the lack of access to certain infrastructures such as advanced technologies, have not been immune to errors and deficiencies. These shortcomings have primarily arisen from excessive reliance on the human factor, the absence of comprehensive and unlimited systems of legal data, the lack of accessible mechanisms for legal advisory and support services, excessive dependence on oral evidence (such as witness testimony), the impossibility of systematic documentation and archiving of evidence, the absence of mechanisms necessary for conducting judicial hearings publicly on a broad scale, and other similar factors. In light of developments in recent years, improvements in infrastructure, and advances in new information and data-processing technologies—including artificial intelligence—and their use in achieving human rights ideals, particularly fair trial guarantees, numerous human rights instruments have endorsed and accepted this approach. Among these instruments is the European Declaration on Digital Rights and Principles for the Digital Decade adopted by the European Commission in 2022, which under the third heading entitled "Freedom of Choice" provides that: "Everyone should be able to benefit from the advantages of artificial intelligence in the digital environment through informed choices, while being protected against risks and harm to health, safety, and fundamental rights." The concurrent use of the terms "advantages" and "risks" in the text of the Declaration indicates that new technologies, alongside their benefits, inevitably entail certain dangers. The aim of this study is to examine the role of artificial intelligence in ensuring fair and impartial criminal proceedings within Iran's criminal justice system. One of the most significant judicial applications of artificial intelligence is the use of intelligent tools that assist judges in the decision-making process (Taghi'i & Jami Pour, 2024).

2. Artificial Intelligence Tools in the Realization of Criminal Justice

Artificial intelligence is not a substitute for human expertise; rather, it is a powerful tool that enhances the capabilities of law enforcement organizations. AI-based solutions can assist law enforcement agencies in decision-making and in performing their duties. They can improve efficiency, promote data-driven approaches, and expand capabilities for specific tasks or decisions. For example, AI applications can help determine the number of officers required by an agency, identify optimal resource deployment locations, and design efficient scheduling strategies for officers. AI-based solutions promise increased efficiency, the promotion of data-driven practices, and the expansion of operational capacities for law enforcement organizations. The primary challenge for law enforcement agencies lies in identifying use cases where data quality and availability, technological maturity, and ethical constraints align with organizational needs and societal expectations. A critical step in design thinking is identifying how an AI application supports law enforcement—such as completing a task or facilitating a decision—and determining the appropriate level of AI involvement, ranging from assisting end users in performing tasks more efficiently to full automation. Law enforcement leaders must evaluate both AI-based and non-AI-based solutions to determine which best meets operational needs (Sharma, 2023).

For each decision or task in daily law enforcement operations, there exists a unique context and a set of constraints that must be considered. Although not all tasks are suitable for artificial intelligence, these technologies can provide significant benefits to law enforcement officers, including cost savings, improved efficiency, data-driven practices, and advanced capabilities.

Technology is constantly evolving. While criminals use the latest technologies to deceive governments and law enforcement organizations, police forces can use technology not merely to avoid falling behind but to remain one step ahead. Human errors can have serious consequences in legal actions. By contrast, artificial intelligence systems can process and analyze vast volumes of data with high accuracy, thereby minimizing errors typically associated with manual tasks such as contract review and data extraction. New technologies have fundamentally transformed the law enforcement industry and the criminal justice system as a whole. Today, police and other law enforcement authorities rely on a wide range of technologies to enforce laws and prevent crime in a safe and efficient manner. Artificial intelligence, predictive policing, social media forensics, and facial recognition equip law enforcement agencies with the tools required to continue combating crime in the digital age. Artificial intelligence enables forensic laboratories to identify and process low-level, degraded, or previously unusable evidence. This includes the ability to detect very small quantities of DNA and to extract usable DNA from evidence that previously could not be analyzed.

Unfortunately, technology has also enabled individuals to commit crimes remotely from their homes and without identification. This phenomenon is commonly referred to as cybercrime and can be defined as any criminal act committed online through the use of computers or other electronic devices to harm others. The pattern-recognition and data-processing capabilities of artificial intelligence allow it to identify crime trends, correlations, and anomalies that may be difficult for human analysts to detect.

3.   Identification of Crime Hotspots

One of the key advantages of AI-based predictive policing is its ability to identify crime hotspots. By analyzing historical crime data, AI algorithms can identify areas with a higher probability of criminal activity. Many departments currently use technologies such as cameras, microphones, and social media monitoring to oversee threats or violations of local laws. Increasingly, artificial intelligence can automatically analyze outputs from these systems—video, audio, and text—to detect legal violations or emerging threats. Whether identifying trends in criminal behavior or detecting unusual financial transactions, AI algorithms can uncover insights that assist law enforcement agencies in apprehending suspects and preventing future crimes.

However, the use of artificial intelligence in law enforcement practices raises ethical concerns, including issues related to privacy, data protection, bias, and transparency. Addressing these concerns is essential to ensuring fairness, protecting sensitive information, and mitigating biases embedded in AI algorithms. Artificial intelligence can also be used to interpret radiological images to assist physicians in determining causes and circumstances of death, to predict and detect abnormal patterns, to learn and recognize new patterns in support of fraud detection, and to predict potential victims of elder abuse. Artificial intelligence introduces "real-time" capabilities into live data streams, enabling the provision of critical information from multiple partners—including police, sheriff departments, fire services, federal agencies, and other social services—and delivering the most accurate and up-to-date information available to law enforcement authorities (Singhal, 2024).

In preparation for the Tokyo Olympic Games, the Japanese police launched AI-based predictive policing systems. AI systems can compare data related to individual crimes to determine whether multiple offenses were committed by the same person. Using this information, artificial intelligence can predict the next move of a criminal. The application of artificial intelligence in advanced military software and technologies can enhance soldier safety, reduce human resource requirements, and improve decision-making. From a safety perspective, humans can delegate hazardous tasks to non-human agents in order to protect themselves.

4.   Ethics of Artificial Intelligence in Law

One of the primary debates surrounding the ethics of artificial intelligence in law concerns the issue of bias. Artificial intelligence systems rely on algorithms and machine learning to analyze data and generate predictions. However, if the data used to train these systems are biased, artificial intelligence may perpetuate such biases and lead to unjust outcomes. With technologies such as cameras, video systems, and social media generating vast volumes of data, artificial intelligence can identify crimes that might otherwise go undetected and, by examining potential criminal activities, contribute to enhanced public security. Consequently, this may increase public trust in law enforcement and criminal justice institutions. In procedural criminal law, artificial intelligence may be used as a law enforcement technology—for example, in predictive policing or as a cyber-agent technology. The role of artificial intelligence in evidence is also examined, including post-search and seizure data

analysis, Bayesian statistics, and scenario development. Artificial intelligence can assist in identifying patterns of criminal activity that may not be immediately apparent to human investigators. On the other hand, concerns persist regarding bias and the potential for misuse by law enforcement agencies. Nevertheless, one fact remains clear: the use of artificial intelligence in criminal justice has become entrenched. According to a survey of criminal justice professionals, 48 percent believe that artificial intelligence makes policing more effective, while only 32 percent believe that artificial intelligence can reduce racial bias in policing. By deploying robots for hazardous tasks, law enforcement agencies can protect the lives of their officers. Robots can operate in dangerous environments, handle hazardous materials, and perform life-threatening missions, thereby reducing risks faced by human officers (Sharma et al., 2024).

Ethical concerns constitute a significant challenge. For instance, artificial intelligence decisions are not always intelligible to humans; AI-based decisions are exposed to risks of inaccuracy, discriminatory outcomes, embedded or encoded biases, and intrusive surveillance practices related to data collection and the protection of court users' privacy. AI-driven analytics can provide actionable insights into human behavior; however, the misuse of such analytics to manipulate human decision-making is ethically problematic. Artificial intelligence can be used to rapidly generate initial drafts by referencing relevant laws, advancing legal arguments, and rebutting (as well as predicting) arguments raised by opposing counsel. While final drafts still require human input, this process becomes significantly faster with the assistance of artificial intelligence. Artificial intelligence offers broad benefits for human development, yet it also entails serious risks. These include, among others, the widening gap between privileged and marginalized groups, the erosion of individual freedoms through surveillance, and the replacement of independent thinking and judgment with automated control (Singhal, 2024).

5. Training Through Artificial Intelligence Tools

The use of artificial intelligence in criminal law is problematic due to the potential consequences of making liberty-depriving decisions on the basis of an algorithm. Society may place excessive trust in these algorithms and make decisions based on their predictions, even if the technology is not as "intelligent" as it appears. Artificial intelligence contributes to improving public security. AI-based predictive policing models have shown promise in helping prevent crimes before they occur. By analyzing historical data on crime patterns and trends, these models can identify high-risk areas in which law enforcement resources should be allocated. AI-based tools support a range of policing activities, from facial recognition for identifying suspects to the analysis of complex regional crime datasets to detect overlooked patterns. Artificial intelligence also supports crime prediction, monitoring closed-circuit television (CCTV) feeds, and—progressively—the automation of routine tasks such as report generation. Virtual reality can provide the type of training needed by today's law enforcement officers by allowing trainees to immerse their senses in a three-dimensional computer environment (Sharma et al., 2024). Users typically view these computer-generated images through a head-mounted device that limits their vision to two small video displays. In addition to facial recognition, an expanding array of biometric (and behavioral) features is being used by law enforcement and the intelligence community. These include voice recognition, palm prints, wrist-vein patterns, iris recognition, gait analysis, and even heartbeat detection.

Cloud-based computing enables police to access and analyze data rapidly and efficiently through multiple methods. Through cloud computing, officers can access accurate statistics and real-time dashboards that monitor entire cities to accelerate investigations and enable better resource planning. Among the reasons cited by respondents, cost is commonly highlighted as the principal barrier to adopting new public-safety technologies. Enhancing evidence capabilities and digital forensic technologies can also contribute to resolving more advanced and technical crimes. Improved technology and digital forensics allow officers to investigate crimes and identify offenders more efficiently and quickly. Artificial intelligence assists in apprehending criminals by performing suspicious-activity identification, primarily through facial recognition technology, head recognition technology, and humanoid-object recognition technology. Surveillance camera footage, photographic evidence, and databases of persons of interest are processed using complex machine learning algorithms. Artificial intelligence can automatically analyze outputs from these systems (video, audio, and text) to identify legal violations or emerging threats. Video analytics software can detect whether an active threat exists within scenes captured by video cameras. Artificial intelligence can help officers write messages and reports and summarize information from written police reports and public reports. Writing tools can help tailor messages for specific audiences, ensuring that a text is appropriate for a particular educational, gender-

based, or ethnic context. Police departments can use AI-based recruitment, interview, and assessment tools to identify top talent. After recruitment, departments can use technology to support onboarding, training, and evaluation of officers. Increasingly, artificial intelligence enables the provision of customized training in addition to classroom instruction, helping each officer work on areas of development unique to them (Sharma, 2023).

Police departments worldwide already use image-recognition technology to automatically identify license plates, vehicles and vehicle models, and even whether a vehicle has modifications such as aftermarket wheels or a ski rack. Artificial intelligence is also widely used in communities across the world (Putra, 2024), including predictive analytics that helps determine where crimes are likely to occur, social media monitoring to track flashpoints in communities, and analytics to determine whether certain individuals have been in contact with certain items or evidence at a particular location. The main difference between a search engine and a chatbot is that a search engine is designed to find information, whereas a chatbot is designed for conversation, answering questions, and solving problems. Officers can begin today by using chatbots wherever they work with documents such as incident reports or submissions to municipal offices. AI-based tools can help you communicate more effectively by drafting documents, generating images, music, or videos aligned with your text, or helping tailor a presentation for a particular audience. An emerging trend is to feed these generative AI systems with specific documents and then enable users to ask questions about those books or records. For example, a user might ask: "When was a convicted murderer later acquitted based on new evidence?" and the system would retrieve an answer from the books available in its database. Imagine a system in which artificial intelligence has "ingested" all data relevant to criminal cases—police reports, depositions, images and video evidence, forensic evidence, and so forth—after which detectives and defense attorneys could query the system about the data. Technology of this kind can turn artificial intelligence into one of the most effective allies in combating crime, increasing clearance rates and reducing the resources required for arresting and prosecuting offenders (Singhal, 2024).

Artificial intelligence systems embedded in smart glasses or smart contact lenses can create an augmented-reality overlay on real-world scenes, identify objects (buildings, vehicles), detect threat scenes, and simultaneously scan historical data regarding reported crimes for a location. AI systems help solve crimes by simplifying the collection, analysis, and operational use of evidence. Detectives can ask their AI assistants questions (for example, "How persuasive will this evidence be at trial?" "Based on similar cases in the past, what else should I ask this informant?") and give instructions (such as "Help me prioritize the next leads to pursue across all suspects, motives, and opportunities"). AI systems can help officers listen to people with knowledge and empathy and communicate more effectively. Chatbots have previously been assessed as more helpful and empathic than human physicians. Similar technology may be adapted for public information officers. Police forces worldwide have expressed regret about the volume of paperwork officers face after incidents in which they are involved. Creating and updating files keeps officers off the streets and can endanger public safety. Artificial intelligence can help by automatically collecting required data, thereby minimizing the time officers devote to reporting. Officers may still need to review and annotate collected data, but they will likely spend far less time completing the entire process manually. Recording data through AI technologies and subsequently fact-checking it not only reduces the time required, but also minimizes the potential for error and enables the facilitation of investigative and tracking processes in a collaborative manner, including biometric information about multiple suspects such as their faces, voices, blood, and fingerprints (Logesh & Raja, 2024).

Investigative officers can be effectively trained in appropriate investigative techniques using AI-based technologies, which reduces the likelihood of procedural mistakes by officers. In addition, it is possible to establish a digital database—enabled by artificial intelligence—containing information related to offenses, methods, and associated violations across various locations. By linking place- and time-related data, artificial intelligence programming and big data can help identify crime hotspots. AI-based approaches can reduce delays and make the trial process more efficient (Dervis & Jahanbakht, 2024). Artificial intelligence can describe or precisely define the content of legal documents and assist judges in issuing interim orders quickly. Pattern-based data analytics can be used to neutralize, weaken, and prosecute unlawful activities. Algorithms can also assist criminal justice professionals in protecting the public in ways that were previously impossible, including by preventing potential victims and potential offenders from becoming perpetrators. Artificial intelligence technologies can provide law enforcement with situational awareness and context and improve police well-being by enabling more informed decision-making in potentially dangerous situations. Robotics and unmanned aerial vehicles (UAVs) have the potential to conduct surveillance

for public safety, be integrated into broader public safety systems, and offer a safer alternative to putting the public and law enforcement personnel at risk. Robotics and UAVs may also be used for retrieval, gathering necessary information, and supporting criminal justice experts in ways that have not yet been fully planned. Such resources can be used to track illegal child imagery before it is disseminated among pedophiles.

Dubai Police, since 2017, has been able to showcase a robot capable of patrolling and identifying criminal activities in the city. The government of the Asian country announced that this police robot can identify various human states and emotions such as happiness, anger, or sadness, enabling it to approach citizens or visitors in different ways or to greet them. It is capable of speaking between 6 and 9 languages (depending on sources), so that tourists can resolve their complaints without confusion or misunderstanding. Dubai's government also intends, by 2030, to replace 25 percent of its police force with unarmed robots to assist in identifying criminals, collecting evidence, and preventing criminal activities in the area. Machine learning within artificial intelligence has opened many doors for law enforcement authorities involved in human trafficking investigations (Nwachukwu & Affen, 2023). The University of Nottingham conducted a study to demonstrate the potential use of machine learning. Researchers effectively mapped labor exploitation in the "brick belt," a region stretching across Pakistan, northern India, Nepal, and Bangladesh. The brick belt is recognized as a location of severe labor exploitation. Using artificial intelligence, researchers trained a model to detect the sizes, shapes, and shadows commonly associated with brick kilns. Other researchers developed an AI engine that can help identify the locations of sex trafficking victims. The AI system identifies hotels based on a database containing nearly one million images from thousands of hotels worldwide. Images of victims are compared against the database to determine the location of the hotel room shown in the image. This AI system uses furniture, color schemes, wall art, and bedding to help identify the hotel (Kunal, 2023).

With the emergence of artificial intelligence, many new machine learning tools help protect us by enabling rapid and accurate tracking—through data—of individuals who may commit crimes before they occur. However, the tools themselves generate a problem: the data used to "train" software systems often contain embedded biases and, in many cases, function primarily to reinforce inequality. Black individuals are reported for crimes more frequently than white individuals—whether the reporter is white or Black. This can lead to predominantly Black neighborhoods being disproportionately labeled as "high risk." If police believe they know where the most crime occurs, they may allocate more resources to monitoring a particular area. This logic is flawed: if more police are deployed to a given neighborhood, it is unsurprising that "more" crime will appear there. When machine learning algorithms are fed with this "data" to train predictive systems, they reproduce the bias and reinforce erroneous ideas about which neighborhoods are more "high risk" (Sharma et al., 2024). Another problem is that this mode of thinking relies on past information. While the past may provide clues about future behavior, it does not account for the concept and potential of rehabilitation, and it contributes to reinforcing negative perspectives and extending punishment for those who have already "paid their debt." From the moment a police officer mistakenly identifies a suspect until the moment the officer realizes the error, significant coercive action may occur: the suspect may be arrested, taken to the police station, and detained.

6. Facial Recognition Systems

These systems can be frightening, with potentially irreparable consequences, including violations of human rights, and they have also demonstrated bias against people of color. Automated surveillance systems remove direct human oversight. As law enforcement agencies increasingly rely on these deep-learning tools, the tools themselves acquire a form of power that warrants serious scrutiny. A number of concerns have been raised regarding law enforcement use of artificial intelligence, including whether such use perpetuates existing biases. One criticism is that the data on which the software is trained are themselves biased, thereby teaching bias to AI systems. Another concern is whether reliance on AI technologies may lead police to disregard contradictory evidence (Sharma et al., 2024). Policymakers may consider increased oversight of police use of AI systems to help assess and mitigate some of these shortcomings. Whether in relation to sensors, CCTV cameras, or digital contact tracing, it is critically important to remain sensitive to public perceptions regarding data collection and data use, to communicate openly, and to be transparent about what is being done. Another key consideration is accountability in the context of artificial intelligence.

Systems can fail or generate unintended consequences. Determining responsibility for actions taken by AI algorithms requires clear guidelines and frameworks in order to prevent potential harm to individuals or communities. Racial profiling is not only harmful to targeted individuals and communities, but also detrimental to society as a whole. Addressing these biases is an ethical imperative. The erosion of trust in law enforcement agencies and professionals is a serious concern that can lead to social fragmentation and hinder the maintenance of public order and security. The weakening of civil rights through unjust identification practices can have profound legal consequences. One way to address these issues is to reform AI algorithms and use more diverse datasets. Often, biases in AI outputs reflect skewed data on which the systems were trained. By ensuring that datasets are representative of all racial, ethnic, and demographic groups, fairer AI tools can be developed. Similarly, designing better algorithms specifically intended to detect and control bias can help promote fairer deployment of AI systems in policing (Singhal, 2024).

As system costs decrease, both law enforcement agencies and private companies have found new applications for these surveillance tools. From creating "virtual fences" to precisely define vehicle entry and exit into a geographic boundary or jurisdiction, to the automatic issuance of red-light violation tickets, machine-vision implementations are among the most widely used applications in contemporary law enforcement. AI-enabled hardware is increasingly deployed in new law enforcement use cases, such as facial recognition in large public spaces and real-time weapon detection. Artificial intelligence may also play an important role in reducing unconscious bias within the criminal justice system. This includes using AI-based editing capabilities to counter potential bias by automatically redacting race and other background characteristics of suspects and victims from police narratives, with the aim of enabling prosecutors to make decisions without engaging in biased reasoning (Putra, 2024).

Law enforcement agencies have access to systems that detect, record, and geolocate gunshots. Local law enforcement organizations in more than 100 cities have already used acoustic gunshot detection systems. More recently, AI startups have incorporated visual weapon-detection technologies into these systems to identify shootings before shots are fired. A nonprofit startup has used Amazon's facial recognition technology to scan online advertisements and the dark web to locate images of known missing children (Kunal, 2023). The use of artificial intelligence demonstrates how systems can strengthen—rather than replace—traditional policing practices. After trafficked children are identified, conventional police methods must still be employed to arrest perpetrators or rescue victims. AI tools are also used to identify and disrupt child-pornography supply chains and apprehend child predators. Microsoft, in collaboration with other organizations, has developed tools such as Project Artemis, which identifies communication patterns used by predators in online chat rooms to target children (Nwachukwu & Affen, 2023).

In addition, other consumer internet-monitoring companies have expanded their impact by partnering with law enforcement agencies to identify child predators. Police organizations increasingly seek AI-based solutions for video redaction. Companies such as Microsoft, along with academic institutions and other technology vendors, are actively developing configurable video-editing solutions that remove identifying information prior to the public release of police body-camera footage. Some jurisdictions have even established timelines for the public release of such recordings. All of these processes are enabled through artificial intelligence. Automatic speech-recognition software improves the quality and efficiency of law enforcement reports. Instead of typing narrative reports, officers can use voice-to-text dictation tools to accelerate reporting and reduce human error (Logesh & Raja, 2024).

Law enforcement agencies and emergency medical services can also use these systems to capture data from incoming calls, inform resource-deployment decisions, or assist with reporting. Integrating AI into operational systems can lead to optimized resource allocation, as well as time and cost savings, given the capacity of AI systems to analyze historical data, generate predictions, inform decision-making, and automate workflows. Moreover, artificial intelligence enables systems to learn from and adapt their recommendations in real time. AI is used to strengthen both location-based and person-based predictive policing models (Dervis & Jahanbakht, 2024). Location-based predictive policing uses information to identify specific areas (at particular times) that are at heightened risk of increased crime or disorder. Person-based predictive policing uses information about individuals—such as their interactions with the criminal justice system—to identify persons at risk of involvement in future incidents, either as victims or offenders.

Machine learning is also used to improve homicide investigations and clearance rates. Research teams have applied machine-learning techniques to extensive homicide databases containing optically scanned information from more than 6,000 homicide case files spanning a 21-year period (1990–2010) to identify predictors of clearance and conviction in homicide and shooting cases, and to measure similarities and differences between predictors of firearm homicides and shooting incidents. These teams aim to test and evaluate investigative tools based on deep-learning algorithms (Gao et al., 2023).

Another important application of artificial intelligence in enforcement relates to the prediction of suspicious and emergent criminal behavior across networks of cameras. This also involves analyzing clothing, skeletal structure, movement patterns, and directional prediction to identify and re-identify persons of interest across multiple cameras and images. Artificial intelligence is also scientifically valuable for evidence processing within law enforcement communities, particularly in forensic testing. Biological materials such as blood, saliva, semen, and skin cells can be transferred through contact with persons and objects during the commission of crimes. As technology has advanced, analytical sensitivity has increased, allowing forensic scientists to identify and process low-level, degraded, or previously unusable evidence (Zhu et al., 2023).

Law enforcement agencies use AI tools to collect and analyze social-media information—including posts, emojis, and social connections—and to cross-reference these data with private datasets in order to build comprehensive profiles (Nguyen & Mogaji, 2023). Artificial intelligence is used to analyze addresses, phone numbers, text messages, and related data to ultimately determine the physical location of suspects. Many of these software systems collect biometric data in addition to capturing images. While facial-recognition technologies face accuracy challenges, they can be enhanced through biometric information to improve precision. Globally, law enforcement units use facial recognition to locate wanted persons, identify individuals depicted in images with minimal false positives, identify injured or unconscious victims in traffic accidents, conduct retrospective identity verification, and cross-check identities against existing databases (Ersoy, 2024).

Traditional information sharing often requires access to multiple databases and manual comparison by individual officers or teams, a process that can take hours or days. By contrast, artificial intelligence can rapidly query multiple databases and share results, enabling intelligent knowledge-sharing that benefits all participating police forces and law enforcement organizations. Deep learning—a subset of AI—is poised to redefine forensic science within law enforcement by offering tools and techniques that simplify and enhance the identification and interpretation of physical evidence. Deep-learning tools are also used to analyze crime-scene photographs and videos, highlighting subtle details—such as concealed weapons or faint signs of struggle—that might escape the human eye. These technological advances not only accelerate evidence collection and analysis but also substantially reduce the likelihood of human error (Loureiro et al., 2023).

Police and financial-intelligence units can visually track cryptocurrency transactions across multiple blockchains using corporate visualization engines. These interactive visual interfaces help investigators follow money trails by identifying anomalies and drawing user attention. Many criminals have records across counties and states, yet most law enforcement agencies can access only their own records. A solution lies in standardizing and integrating data across multiple agencies, enabling access to a suspect's complete criminal history. Centralized governmental entities can combine information from state, local, tribal, federal, and private partners, while AI accelerates large-scale data cleansing and integration. Greater data availability improves machine-learning predictions by enabling systems to identify more complex patterns and relationships (Abdulsalam & Tajudeen, 2024).

AI-based tools can also analyze victims' mobile phones, map communication patterns, catalog objects appearing in photographs, and make data collection and interpretation more manageable for identifying suspects and understanding events. Video processing that decomposes footage into objects and behaviors enables law enforcement to search larger volumes of video evidence more effectively while assigning fewer officers to video review. Over time, agencies often lose experienced officers due to turnover or retirement, creating gaps in knowledge and experience. Research suggests that AI applications in policing—such as facial recognition—can help bridge these gaps by providing insight and experience that reduce impulsive decision-making by less experienced officers. Artificial intelligence also has notable applications in courts.

Another application of AI is predictive justice, which involves the statistical analysis of large volumes of judicial data—primarily previously issued court decisions—to predict judicial outcomes. This can help judges focus their time on cases where their expertise adds the greatest value and, in the long term, promote greater consistency and stability in justice systems, thereby enhancing predictability. Artificial intelligence can also analyze hundreds of thousands of criminal-justice-related data points

to predict recidivism among fugitives (Santy & Iffan, 2023). Such AI applications can be particularly useful for bail services, increasing fine recovery, and enabling more optimal resource allocation, ultimately contributing to more efficient justice systems. Globally, criminal justice systems draw on various resources—including technology and information—to limit crime and criminal activity.

7. Conclusion

A comprehensive examination of the role of artificial intelligence in criminal adjudication shows that this technology is no longer a mere auxiliary tool within the justice process; rather, it has become a structural and influential element shaping the quality, speed, accuracy, and overall orientation of the criminal justice system. In practice, AI capabilities—ranging from big-data analytics and the detection of complex patterns to supporting judicial and law enforcement decision-making—can reduce longstanding deficiencies in adjudicatory systems, such as excessive delays, human error, inconsistency in judicial decisions, ضعف in the scientific detection of crime, and constraints on human resources, in an unprecedented manner. Yet alongside these capacities, challenges have emerged that indicate untested or poorly governed deployment of AI may itself become a driver of violations of defendants' fundamental rights, the deepening of structural discrimination, threats to privacy, and the weakening of meaningful human oversight.

Iran's criminal justice system is currently at a point where the proper use of emerging technologies is not a luxury choice, but a strategic necessity for the realization of justice. The Judicial Transformation Document likewise emphasizes this necessity and delineates a direction in which AI can increase the speed of proceedings, enable more precise case monitoring, support scientific crime detection, and significantly enhance forensic effectiveness, digital evidence analysis, data management, and the prediction of recidivism risk. However, these achievements will align with fair trial principles only if clear regulations and robust supervisory mechanisms are established to address the inherent risks of artificial intelligence. Risks such as algorithmic bias—particularly in predictive policing, facial recognition, and risk scoring—which can disproportionately target specific social groups; the weakening of the right to be heard when decision-making becomes overly dependent on machine outputs; and privacy violations where large-scale biometric data and surveillance networks are collected and processed without adequate controls—all demonstrate that, without prudent regulation, "technological justice" can become the opposite of justice.

If artificial intelligence is deployed on the basis of transparency, explainability, accountability, and bias control, it can make criminal justice not only faster, but also fairer. But if algorithmic processes remain opaque, non-explainable, and free from oversight, even the most advanced technologies will, instead of reforming the justice system, expose it to discrimination, error, and the concentration of power. In this context, preserving the role of the human judge is of fundamental importance, because no technology—regardless of its level of accuracy—possesses the capacity to grasp social context, human identity, behavioral motivations, and the ethical complexities inherent in criminal decisions. The judge must remain the final decision-maker, while artificial intelligence should function as a support instrument rather than a decision authority.

Looking ahead, fair adjudication in the digital era is not achieved by eliminating technology, but by consciously constraining and steering it. Modern criminal justice must be able to leverage the unparalleled power of AI to strengthen investigation, crime detection, expedite proceedings, and improve the quality of judgments; at the same time, it must protect core human rights values through a precise framework—values such as the right to defense, the right to dignity, the right to privacy, the presumption of innocence, and the right to access an impartial process. This duality—technology and human rights—is not contradictory, but complementary, provided that legislation, supervision, and policymaking remain one step ahead of technological change.

Accordingly, artificial intelligence is neither an inherent threat to justice nor its absolute savior; it is a capacity whose quality and direction of impact depend on the legal system, the model of regulation, operational transparency, and the extent of human oversight. If Iran's criminal justice system can employ this technology within a framework grounded in human rights principles, technical standards, data governance, and rigorous judicial supervision, then AI—rather than producing discrimination and disruption—can become a tool for elevating adjudication and safeguarding justice. Such an approach clarifies the future trajectory of criminal justice: a future in which technology is the assistant of justice, not its substitute; and justice is not the victim of the machine's speed and accuracy, but the principal beneficiary of digital transformation.

Ethical Considerations

Acknowledgments

Conflict of Interest

Funding/Financial Support

References

Abdulsalam, T. A., & Tajudeen, R. B. (2024). Artificial Intelligence (AI) in the Banking Industry: A Review of Service Areas and Customer Service Journeys in Emerging Economies. *BMC*, *68*(3), 19-43. https://doi.org/10.56065/9hfvrq20

Dervis, O., & Jahanbakht, M. (2024). Artificial Intelligence (AI)-based Customer Relationship Management (CRM): a comprehensive bibliometric and systematic literature review with outlook on future research. *Enterprise Information Systems*, *18*(8). https://doi.org/10.1080/17517575.2024.2351869

Ersoy, A. B. (2024). Artificial Intelligence Applications Used in on-Line Retail in China and Their Relationship to Customer Satisfaction and Loyalty. *International Journal of Business and Applied Social Science*, 8-17. https://doi.org/10.33642/ijbass.v10n3p2

Gao, L., Li, G., Tsai, F., Gao, C., Zhu, M., & Qu, X. (2023). The impact of artificial intelligence stimuli on customer engagement and value co-creation: The moderating role of customer ability readiness. *J. Res. Interact. Mark.*, *17*, 317-333. https://doi.org/10.1108/JRIM-10-2021-0260

Kunal, K. (2023). A Behavioural Study on the Impact of Artificial Intelligence on Customer Services Retention in Telecom Industry. *Russian Law Journal*, *11*(5s). https://doi.org/10.52783/rlj.v11i5s.960

Logesh, M. S., & Raja, S. C. (2024). A Study on the Impact of Artificial Intelligence on Online Customer Satisfaction. *Ejf*, *03*(05), 133-144. https://doi.org/10.58394/ejf.2024.3514

Loureiro, S. M. C., Ferreira, M. M., Bilro, R. G., & Marquès, L. (2023). How Artificial Intelligence Tools Influence Customer Experience and Avoidance of Similarity. *Global Fashion Management Conference*, 646-649. https://doi.org/10.15444/gmc2023.07.07.04

Nguyen, N. P., & Mogaji, E. (2023). Artificial intelligence for seamless experience across channels. In *Artificial intelligence in customer service: The next frontier for personalized engagement*. Springer International Publishing. https://doi.org/10.1007/978-3-031-33898-4_8

Nwachukwu, D., & Affen, M. P. (2023). Artificial intelligence marketing practices: The way forward to better customer experience management in Africa (Systematic Literature Review). *International Academy Journal of Management, Marketing and Entrepreneurial Studies*, *9*(2), 44-62. https://www.researchgate.net/profile/Darlington-Nwachukwu/publication/369370172_Artificial_Intelligence_Marketing_Practices_The_Way_Forward_to_Better_Customer_Experience_Management_in_Africa_Systematic_Literature_Review/links/64181fe6a1b72772e411b0c9/Artificial-Intelligence-Marketing-Practices-The-Way-Forward-to-Better-Customer-Experience-Management-in-Africa-Systematic-Literature-Review.pdf

Putra, H. S. (2024). Exploring Business Potential Through the Application of Artificial Intelligence: Impact Analysis on Operational Efficiency, Decision Making, and Customer Experience. *Escalate*, *1*(02), 72-81. https://doi.org/10.61536/escalate.v1i02.24

Santy, R. D., & Iffan, M. (2023). The Effect of Artificial Intelligence and Gamification on Online Purchase Intention Mediated by Customer Experience: Study on Indonesian Marketplace Users. *Mix Jurnal Ilmiah Manajemen*, *13*(1), 227. https://doi.org/10.22441/jurnal_mix.2023.v13i1.015

Sharma, A. (2023). Analyzing the Role of Artificial Intelligence in Predicting Customer Behavior and Personalizing the Shopping Experience in Ecommerce. *Interantional Journal of Scientific Research in Engineering and Management*, *07*(02). https://doi.org/10.55041/ijsrem17839

Sharma, S., Islam, N., Singh, G., & Dhir, A. (2024). Why Do Retail Customers Adopt Artificial Intelligence (AI) Based Autonomous Decision-Making Systems? *Ieee Transactions on Engineering Management*, *71*, 1846-1861. https://doi.org/10.1109/tem.2022.3157976

Singhal, P. (2024). Understanding the Usability and Response Quality of Artificial Intelligence Chatbots on Customer Engagement in Branded Apparel E-Retailing. 403-420. https://doi.org/10.4018/979-8-3693-7620-1.ch020

Taghi'i, N., & Jami Pour, M. (2024). Exploring the role of artificial intelligence (AI) in customer relationship management (CRM). 1st International Conference on Information Technology, Management, and Computer, https://doi.org/10.1109/AICIT62434.2024.10730178

Zhu, Y., Zhang, R., Zou, Y., & Jin, D. (2023). Investigating Customers' Responses to Artificial Intelligence Chatbots in Online Travel Agencies: The Moderating Role of Product Familiarity. *Journal of Hospitality and Tourism Technology*. https://doi.org/10.1108/jhtt-02-2022-0041