Application of Artificial Intelligence in the Assessment and Determination of Punishment Effectiveness (A Comparative Study of Iran and Turkey)

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Abstract

One of the functional domains of artificial intelligence (AI) is in the criminal justice process. Although international legal instruments do not contain explicit provisions granting legitimacy to the use of AI in criminal justice, criminal investigations, or preventive procedures, the role of AI in realizing criminal justice—given the rapid advancement of technology—cannot be overlooked. Turkey, as a country with a civil law–based legal structure and considerable influence from European legal systems, particularly those of France and Germany, has developed a specific framework for the determination and execution of punishments. Artificial intelligence, as one of the major technological advancements of the twenty-first century, has created new opportunities for the analysis, prediction, and optimization of criminal policy. Data analysis for assessing the effectiveness of punishments is one of the most significant applications of AI in the criminal justice system. Reducing recidivism, facilitating the offender's reintegration into healthy social life, generating deterrence at the societal level, and ensuring offender rehabilitation and reform are among the key AI-based criteria for evaluating punishment effectiveness. Therefore, each punishment must be examined from these perspectives to determine whether it meets these objectives. Data analysis using AI enables a scientific and precise evaluation of the effectiveness of punishments. This article examines the applications of AI in analyzing the effectiveness of punishments—comparatively between Iran and Turkey—with particular emphasis on reducing recidivism rates and rehabilitating offenders.

Keywords: Artificial Intelligence, Criminal Justice System, Judicial System, Recidivism Prevention

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1. Introduction

Today, with the expansion of modern technologies and the emergence of artificial intelligence (AI), new opportunities have been created for improving judicial processes and evaluating punishments (Jalali, 2024; Nazemnejad, 2024). One of the key

challenges of the criminal justice system is the precise assessment of punishment effectiveness and the selection of sanctions that contribute to offender rehabilitation and the enhancement of public security (Roman, 2025). The use of AI tools and algorithms can, through the analysis of vast volumes of criminal data, judicial records, and individual and social variables, provide a more accurate picture of the efficiency of different punishments and help support systematic, evidence-based decision-making (Rafiq, 2024). Technological developments in AI have created an opportunity for the criminal justice system to move away from traditional approaches and toward data-driven and predictable decision-making models (Trang et al., 2024). One of the most important challenges of this system is evaluating the effectiveness of punishments in deterrence, rehabilitation, and preventing recidivism (Parsa, 2024).

In contemporary societies, criminal justice is not limited to punishing the offender; rather, long-term objectives such as behavioral reform, rehabilitation, and reducing the rate of returning to crime are taken into account (Zuwanda et al., 2024). Determining the true effectiveness of punishments has always been challenging due to the complexity of human behavior and individual differences. In this context, AI—with its ability to analyze large datasets and model complex behavioral patterns—can provide new insights for criminal policymakers (Pasupuleti, 2024). One of the principal applications of AI in this field is the analysis of judicial data, criminal records, and demographic and psychological characteristics of offenders (Faghani & Ghoreshi Mohammadi, 2025). Using machine learning algorithms, it becomes possible to examine the relationship between the type of crime, the punishment imposed, and the likelihood of recidivism (Jalali, 2024). These analyses assist decision-makers in designing punishments tailored to the characteristics of the offender and the offense.

In data analysis related to assessing and determining the effectiveness of punishments, key questions arise: Has imprisonment reduced recidivism, or has it had the opposite effect? Are rehabilitation programs—such as counseling or vocational training—more effective than incarceration? For which categories of offenders are alternative sanctions more efficient? If these questions can be answered, it becomes possible to determine how effective AI has been in assessing punishment effectiveness (Nonju & Ihua-Maduenyi, 2024).

In Iran and Turkey—two countries with distinct cultural and legal backgrounds—a comparative examination of the role of AI in assessing and determining punishment effectiveness can reveal new dimensions of the capacities and challenges in this field (Sezavar et al., 2024). However, the absence of data-driven approaches and challenges related to the collection and analysis of judicial data increase the complexity of this process (Rezaeipour, 2024). Therefore, it is necessary to scientifically and comparatively examine the role of AI in measuring the effectiveness of punishments and to clarify the requirements, obstacles, and opportunities for implementing such technologies within the judicial systems of Iran and Turkey (Rajaei & Amiri, 2024). Turkish criminal law has attempted in recent years to align itself with international standards and enhance punishment effectiveness (Stéphanie Laulhé & Yulia, 2024). Nevertheless, to achieve effective and sustainable justice, deeper reforms, expanded use of alternative sanctions, and greater focus on the social and human dimensions of punishment remain essential (Pires, 2024). This study has been conducted to address the application of AI in assessing and determining punishment effectiveness, and its importance stems from the modern nature of AI and its connection with other fields, especially information sciences and data discovery (Husayn, 2025). It should be noted that AI systems can contribute to achieving justice, controlling crime, and assisting with criminal investigations (Oluwaseye et al., 2024). The present article, through a review of theoretical literature and examination of practical applications, explores the role and potential of AI in analyzing and improving the effectiveness of punishments within the judicial systems of Iran and Turkey (Rajaei & Amiri, 2025).

2. Definition of Artificial Intelligence and Its Characteristics

Artificial intelligence is a technology that enables computers and machines to simulate human intelligence and problem-solving abilities (Roman, 2025). AI—either alone or in combination with other technologies such as sensors, geographic positioning, and robotics—can perform tasks requiring intelligence or human intervention. Digital assistants, navigation systems for autonomous vehicles, and AI-based tools are only some examples of AI applications in everyday life (Pasupuleti,

2024). As a branch of computer science, AI includes machine learning and deep learning. It involves developing AI algorithms modeled on human decision-making processes, allowing them to "learn" from available data and produce more accurate classifications and predictions over time (Zakerinia & Gholampour, 2024). AI has undergone many waves of development, and it is currently experiencing major advances in natural language processing (Trang et al., 2024).

Today, generative AI can learn and combine not only human language but also other types of data such as images, videos, software code, and even molecular structures (Nonju & Ihua-Maduenyi, 2024). Applications of AI are increasing daily; however, as the promotion of AI-based tools in business grows, significant ethical and legal challenges have emerged (Stéphanie Laulhé & Yulia, 2024). AI is divided into weak (narrow) and strong (general) AI. Weak AI is trained and focused on performing specific tasks and includes most AI systems surrounding us today (Pires, 2024). Strong AI consists of artificial general intelligence and superintelligence—hypothetical forms of AI possessing human-level intelligence, self-awareness, and the ability to solve problems, learn, and plan for the future—surpassing human cognitive capacities (Roman, 2025). Although strong AI remains purely theoretical and no practical examples currently exist, AI researchers continue to investigate its development (Rafiq, 2024).

The functioning of AI relies on machine learning and deep learning algorithms using neural networks to learn from massive datasets. These networks are programmed structures modeled on human brain decision processes. They consist of interconnected layers of nodes that extract features from data and predict what the data represent (Faghani & Ghoreshi Mohammadi, 2025). Typically, these algorithms are limited to supervised learning, where data must be structured or labeled by human experts so the algorithm can extract features (Rezaeipour, 2024). Deep learning algorithms use deep neural networks—comprising an input layer, three or more (sometimes hundreds) hidden layers, and an output layer. These multi-layered networks enable unsupervised learning, automatically extracting features from large, unlabeled, unstructured datasets (Jalali, 2024). Since they require no human intervention, deep learning allows machine learning to scale.

Generative AI refers to deep learning models capable of receiving raw input data and generating probabilistic outputs upon request (Pasupuleti, 2024). Generative models have long been used in statistics for analyzing numerical datasets; however, the emergence of deep learning expanded their applicability to images, speech, and other complex data types (Trang et al., 2024). In the future, models will be trained on broad sets of unlabeled data that can be adapted for various tasks, replacing single-domain systems with more general AI architectures (Roman, 2025).

The idea of a "thinking machine" dates back to ancient Greece. In 1950, Alan Turing published his theory of computation and machine intelligence, asking, "Can machines think?" and proposing the Turing Test, in which a human evaluator attempts to distinguish between human and machine responses—a concept deeply connected to linguistic processing and foundational in AI history (Stéphanie Laulhé & Yulia, 2024). In 1956, during the first Dartmouth Conference, John McCarthy coined the term "artificial intelligence" (Oluwaseye et al., 2024). In 1967, Frank Rosenblatt developed the first computer based on a neural network that learned through trial and error (Parsa, 2024). In the 1980s, neural networks with self-training algorithms became widely used in AI applications (Nonju & Ihua-Maduenyi, 2024). In 1995, Stuart Russell and Peter Norvig published *Artificial Intelligence: A Modern Approach*, distinguishing AI systems based on rationality and thinking versus acting (Rafiq, 2024). In 2004, McCarthy authored *What Is Artificial Intelligence?*, proposing a widely cited definition (Roman, 2025). In 2015, a supercomputer using a convolutional neural network identified and classified images with higher accuracy than an average human (Jalali, 2024). AI has also been used in competitive settings, including defeating chess champions.

By 2023, large-scale language models such as ChatGPT marked a major shift in AI capability and organizational value creation, as deep learning models could now be pre-trained on vast amounts of raw, unlabeled data (Pasupuleti, 2024). Today, AI systems have numerous real-world applications. Computer speech recognition (speech-to-text) is one such use. Computer vision enables systems to extract meaningful information from digital images, videos, and visual inputs and act upon them. Its ability to provide recommendations distinguishes it from simple image-recognition tasks (Zuwanda et al., 2024).

Computer vision using neural networks now finds applications in photo tagging on social media, radiological imaging in healthcare, and autonomous vehicles in the automotive industry. Robotics also relies on structured data to make autonomous

decisions and can understand human speech and respond accordingly (Pires, 2024). Search and pattern-recognition algorithms in AI are not merely predictive—they conduct hierarchical analyses of data while providing immediate insight and transparency. AI models can scan large datasets and detect anomalies, which may signal defective equipment, human error, or security breaches. For instance, AI is effective in protecting digital businesses against cyber threats (Nonju & Ihua-Maduenyi, 2024). These capabilities underscore AI's relevance in criminal justice, where its role in achieving justice is examined in detail in the following sections (Rajaei & Amiri, 2025).

3. Application of Artificial Intelligence in the Realization of Criminal Justice

The role of artificial intelligence in law enforcement, preliminary investigations of suspects, and proving the commission of crimes is highly significant in these domains. AI can have multiple functions in this regard, including assisting in the analysis of large volumes of data and identifying hidden patterns within them—patterns that may help in detecting crimes and identifying suspects (Nazemnejad, 2024; Zuwanda et al., 2024). By using AI algorithms, it becomes possible to detect criminal patterns and unlawful activities; moreover, AI can contribute to improving the organization of data and information, which in turn can expedite investigative procedures and law enforcement operations (Jalali, 2024). However, it should be emphasized that the use of AI in these areas requires full respect for human rights and the protection of individuals' privacy, and must be carried out carefully and in compliance with the rules and regulations relating to the protection of citizens' rights (Nonju & Ihua-Maduenyi, 2024; Stéphanie Laulhé & Yulia, 2024). Therefore, AI can be functional and effective at various stages of crime commission, preliminary investigations of suspects, and related processes (Rajaei & Amiri, 2025).

In Turkey, criminal justice is also one of the most important branches of the legal system, directly connected to individuals' life, liberty, and dignity. In this context, technological developments—especially AI—can bring about a profound transformation in efficiency, accuracy, and fairness in criminal adjudication (Trang et al., 2024). Turkey, as a developing country with a complex judicial system, is entering a stage in which AI is emerging as a support tool for criminal justice. In criminal proceedings, speed of adjudication, protection of defendants' rights, prevention of judicial errors, and combating complex crimes are of critical importance (Rafiq, 2024). AI can play a role in all these stages. At the same time, however, concerns arise regarding the preservation of fair-trial guarantees, judicial independence, and the right to defense (Stéphanie Laulhé & Yulia, 2024). In recent years, Turkey has undertaken to modernize the digital infrastructure of its judiciary, including a national judicial information system, digital case files, online communication between judicial authorities, and pilot AI projects in prosecutors' offices and police units for the analysis of cybercrimes, crime prediction, and criminal data analytics (Zuwanda et al., 2024). Nevertheless, a clear and comprehensive legal framework governing how AI may be used in criminal proceedings has not yet been fully established (Parsa, 2024).

4. The Importance of Applying Artificial Intelligence in the Evaluation and Determination of Punishment Effectiveness

Assessing the effectiveness of punishments is one of the fundamental issues in contemporary criminal policy. The key question is whether punishments truly lead to intended objectives such as deterrence, offender rehabilitation, protection of society, and realization of criminal justice. In traditional systems, assessing effectiveness has usually relied on aggregate statistics, post-sentence analyses, and sociological studies—methods that are often time-consuming, costly, and limited to past data (Rafiq, 2024).

The emergence of AI and big data analytics has created a profound transformation in this field. These technologies can, by processing vast quantities of criminal, social, and behavioral data, uncover hidden patterns and accurately predict the likelihood that a given type of punishment will succeed or fail (Pasupuleti, 2024). As a result, policymakers and judges can become aware—prior to imposing a sentence—of the probable effects of a punishment on the offender and society (Roman, 2025).

4.1. Transition from Traditional Evaluation to Data-Driven Analysis

In the criminal justice systems of Iran and Turkey, as in many developing countries, the evaluation of punishments is still largely based on reports from judicial organizations, recidivism statistics, and limited interviews with offenders. However, such data rarely reveal the complex relationships among relevant variables. For example, two individuals may commit the same offense but differ completely in their social, psychological, and economic circumstances; consequently, their reactions to the same type of punishment may differ substantially.

In this context, AI—using methods such as artificial neural networks and machine learning—can develop models that automatically identify the variables influencing the success or failure of punishments based on past patterns (Jalali, 2024). Research has shown that the use of predictive models in criminal justice can significantly increase the accuracy of evaluating punishment effectiveness relative to traditional methods (Nazemnejad, 2024). For instance, machine learning algorithms can, using data on the type of offense, age, psychological background, economic status, educational level, and family environment, predict which type of punishment (imprisonment, community service, mandatory counseling, electronic monitoring, etc.) has the highest probability of success in rehabilitating a given individual (Rafiq, 2024). Such prediction not only enhances the efficiency of the criminal justice system, but also helps prevent the imposition of unnecessary and ineffective punishments (Trang et al., 2024).

4.2. Enhancing the Policy of Individualization of Punishment and Restorative Justice

One of the main objectives of the modern criminal justice system is the individualization of punishment—that is, aligning the type and degree of punishment with the offender's personal characteristics. In the past, this objective was mainly pursued through psychological assessments or social-work evaluations; today, however, AI can, by integrating extensive psychological, social, and criminal data, provide a more precise and scientific perspective (Husayn, 2025). In Iran, the principle of individualization is emphasized in Article 37 of the Islamic Penal Code (2013), which authorizes the judge to reduce or alter the punishment based on the offender's personality. In Turkey, Articles 50 and 51 of the Turkish Penal Code refer to alternative sanctions such as suspension of sentence or community service. The use of AI in both systems can assist judges by analyzing similar datasets to make decisions tailored to the specific offender (Parsa, 2024).

For example, AI systems can indicate that for offenders with low educational attainment and substance dependence, "therapeutic and educational interventions" are more effective than "short-term imprisonment." Conversely, for highly educated financial offenders, "compulsory work or proportionate financial penalties" may yield better results. In this way, AI contributes to enhancing individualized justice and the effectiveness of criminal policy (Roman, 2025; Zuwanda et al., 2024).

4.3. Economic and Social Efficiency

Traditional evaluation of punishment effectiveness is usually carried out after execution of the sentence and over long periods, making it costly and irreversible. By contrast, AI models can simulate different scenarios prior to sentencing and predict the costs and consequences of each option. For instance, if data show that imposing "three months' imprisonment" increases the risk of recidivism by 60%, whereas "electronic monitoring" is less costly and associated with a lower recidivism rate, a judge can choose a more economical and effective sanction (Pasupuleti, 2024).

In addition, the use of predictive analytics can lead to optimal allocation of public resources in prison systems and rehabilitation programs. In countries where the annual cost of maintaining each prisoner is very high (for example, Turkey, with an average of several thousand dollars per year), the intelligent substitution of punishments through AI-based assessment can significantly reduce the financial burden on the state (Pires, 2024).

4.4. Smart Validation and Monitoring of Outcomes

One of the fundamental challenges of criminal justice systems is the absence of a scientific and sustainable mechanism for post-sentence evaluation. AI can function as a smart monitoring system that analyzes the performance and behavior of

convicted persons after execution of punishment and issues alerts if signs of risk (such as the likelihood of recidivism) emerge (Nazemnejad, 2024). Such intelligent monitoring enables courts to intervene in a timely manner to prevent reoffending and, at the same time, to use the data generated during sentence execution to improve subsequent models. Studies have shown that the use of such systems can lead to a noticeable reduction in recidivism among offenders under electronic supervision (Rafiq, 2024).

Therefore, the application of AI in evaluating and determining the effectiveness of punishments lies at the intersection of data science, criminal law, and public policy. This technology can enhance precision, justice, and efficiency in criminal decisions, provided that it is deployed within a clear legal, ethical, and transparent framework (Roman, 2025; Stéphanie Laulhé & Yulia, 2024). Ultimately, AI should not replace the judge; rather, it should serve as a "scientific assistant of justice," supporting more accurate and humane decision-making.

5. Data Analysis in Evaluating Punishment Effectiveness within the Legal Systems of Iran and Turkey

Data analysis for evaluating punishment effectiveness is one of the most important applications of AI in the criminal justice system. Criteria such as reducing recidivism rates, enabling the offender's return to a healthy social life, creating deterrence at the societal level, and ensuring offender reform and rehabilitation are central in this assessment. Accordingly, each punishment must be examined from these perspectives to determine whether it fulfills these goals or not. Data analysis using AI enables a scientific and accurate evaluation of punishment effectiveness. This can help make punishments more justice-oriented, reduce costs, and facilitate better reintegration of offenders into society. AI is capable of analyzing large volumes of data related to criminal cases (Jalali, 2024).

These data may include: type of offense, type of punishment imposed, the offender's criminal history, recidivism rate, and the offender's social and economic situation. By analyzing such data, AI systems can answer questions such as: Has imprisonment reduced recidivism, or has it had the opposite effect? Have rehabilitation programs (such as counseling or vocational training) been more effective than incarceration? For which categories of offenders have alternative sanctions been more efficient? (Rafiq, 2024).

AI algorithms can review and analyze thousands of similar cases to determine which types of punishments have been more effective for particular offenses and under what conditions an individual has been rehabilitated—or not—after serving a sentence. If data show that imprisonment for a specific group of offenders leads to higher recidivism, AI can recommend the use of alternative sanctions. A hypothetical application in Iran might involve an individual arrested for trafficking synthetic drugs. AI could assist the judge by analyzing the following: similar cases show that imprisonment for individuals of the same age and psychological profile has produced counterproductive outcomes, whereas "addiction treatment programs plus community service" have yielded better results in reducing repeat offending. Consequently, with AI's confirmation, the judge chooses an alternative punishment that is better for both the individual and society (Nazemnejad, 2024).

In another example, imagine that the prison organization collects, over five years, the following data on 5,000 inmates: age, educational background, type of offense, type of punishment, participation or non-participation in rehabilitation programs, and recidivism within two years. Using a classification model (such as decision trees or neural networks), the algorithm can predict which groups have the highest recidivism rates and which types of punishments or programs have been most effective (Pasupuleti, 2024).

The Turkish criminal justice system is a combination of elements of the continental (Romano-Germanic) legal tradition and modern reforms aimed at convergence with European Union standards. Within this framework, the purpose of punishment is not merely retribution; rather, offender reform and resocialization are among the core principles of the penal system. Article 2 of the Turkish Penal Code (TCK) articulates the principles of proportionality and individualization of punishments. At the same time, Turkey's official policies in recent years have increasingly emphasized rehabilitation, restorative justice, and reducing recidivism. In Turkish law, the use of AI in evaluating and determining punishment effectiveness is not yet explicitly regulated. Currently, AI systems do not possess legal personality in Turkey, and responsibility for their acts lies with developers, producers, or users. Under Article 20(2) of the Turkish Penal Code, only natural persons may bear criminal responsibility; legal

entities such as companies cannot be punished, but security measures may be imposed on them (Zakerinia & Gholampour, 2024).

Nevertheless, the draft Turkish Artificial Intelligence Act, submitted to the Grand National Assembly in June 2024, seeks to establish a legal framework for AI use, including risk management, compliance requirements, and sanctions for violations (Parsa, 2024).

Use of AI in various legal fields in Turkey includes:

- **Prediction of judicial decisions:** Studies using deep learning models have shown that decisions of the Turkish Constitutional Court can be predicted with high accuracy. This technique can be useful in evaluating punishment effectiveness and forecasting sentencing outcomes (Trang et al., 2024).
- **Analysis of criminal records and sentencing recommendations:** AI can analyze criminal histories and identify offenders' behavioral patterns. These analyses help individualize punishments and align them with the risk of recidivism (Rafiq, 2024).
- **Ethical and legal analysis:** Some scholarly works examine the ethical and legal issues associated with AI in criminal law, including the question of AI's criminal responsibility and related challenges (Rezaeipour, 2024; Zuwanda et al., 2024).

6. Applications of Artificial Intelligence in Determining the Effectiveness of Punishments

Artificial intelligence, particularly through machine learning, deep learning, and data mining algorithms, provides advanced tools for analysis and prediction that can identify the strengths and weaknesses of criminal policy. In this section, the most important applications of AI in the criminal justice system are examined in detail (Pasupuleti, 2024; Roman, 2025).

6.1. Prediction of Recidivism

One of the most common and important applications of AI in criminal justice is predicting the likelihood that an offender will reoffend after serving a sentence. Such predictions can play a vital role in judicial decision-making regarding sentencing, parole, or referral to rehabilitation programs. Using classification algorithms such as Random Forest, logistic regression, SVM, and artificial neural networks (ANN), variables like criminal history, individual characteristics, type of offense, behavior in prison, and psychological status of the person can be modeled and analyzed (Jalali, 2024; Rafiq, 2024). For example, the COMPAS system in the United States is one of the best-known AI tools for predicting recidivism, although it has been heavily criticized for racial bias. In Turkey, the use of AI to predict the likelihood that offenders will reoffend after serving their sentences is under consideration. These predictions can be effective in judicial decisions such as conditional release and the determination of the type of punishment (Stéphanie Laulhé & Yulia, 2024; Trang et al., 2024; Zuwanda et al., 2024).

6.2. Analyzing the Effectiveness of Rehabilitation Programs

AI can evaluate the effectiveness of programs such as psychological counseling, addiction treatment, vocational training, and religious or cultural rehabilitation based on the analysis of behavioral outcomes after release. Using tools and methods such as multivariate correlation analysis, causal modeling, and survival analysis (examining how long individuals remain crime-free after release), AI can identify which programs are more effective for specific groups of prisoners and help optimize prison costs by focusing on interventions that have proven effective (Husayn, 2025; Nazemnejad, 2024).

Turkey is modernizing its prisons and increasingly using digital technologies to improve rehabilitation programs. The use of AI can play a role in analyzing and optimizing the effectiveness of these programs (Nazemnejad, 2024; Parsa, 2024).

6.3. Designing Personalized Punishments

AI can propose punishments tailored to an individual's background, personality, and socio-psychological circumstances rather than relying on stereotypical sanctions. This can be done by using recommender systems—similar to those used in e-

commerce—and cluster analysis to group offenders based on behavioral and social patterns (Pasupuleti, 2024; Rajaei & Amiri, 2024). The advantages of this approach include reducing the likelihood of recidivism by aligning the type of punishment with the offender's needs and motivations, strengthening individualized justice, and reducing judicial bureaucracy. Although there is currently no clear evidence of AI being used to design personalized punishments in Turkey, this area could attract attention in the future. AI could analyze offenders' individual characteristics and propose sanctions appropriate to their circumstances (Parsa, 2024; Roman, 2025).

6.4. Monitoring and Analyzing Prisoners' Behavior During Sentence Execution

AI can analyze prisoners' behavioral data—obtained from surveillance cameras, psychological reports, social interactions, and other sources—to detect behavioral changes, aggression, willingness to cooperate, or progress in overcoming addiction. Using video analytics with machine vision, natural language processing (NLP) on psychologists' reports or recorded conversations, and emotion-detection models, AI can identify positive or high-risk behavioral patterns and generate more accurate reports for decisions on furlough, parole, or specific therapeutic programs (Nazemnejad, 2024; Zuwanda et al., 2024). In Turkey, the use of digital technologies in prisons can assist in monitoring and analyzing prisoners' behavior. AI can, by analyzing behavioral data, detect positive or negative changes and contribute to decisions related to parole or rehabilitation programs (Nazemnejad, 2024; Trang et al., 2024).

6.5. Analyzing Effectiveness at the Macro Level (Criminal Policy-Making)

AI can be used to conduct systematic analyses of criminal policies at the national or regional level, such as examining the impact of reducing prison terms, increasing the use of alternative sanctions, or expanding restorative justice. This can be done using tools such as socio-economic predictive models, scenario simulations, and time-series analysis (Pasupuleti, 2024; Pires, 2024). For example, AI can be employed to determine whether a particular alternative sanction (such as community service) results in a lower recidivism rate compared to imprisonment, or to analyze the consequences of changes in drug legislation based on five- or ten-year data (Roman, 2025).

6.6. Detecting Discrimination and Bias in the Criminal Justice System

By examining patterns in sentencing decisions, arrest practices, or parole grants, AI can identify instances of racial, gender, or class discrimination. This requires algorithmic analysis of sentencing records, bias modeling, and pattern comparison across different groups, with the aim of helping to reform the judicial system, reduce structural injustice, and inform lawmakers about vulnerabilities in the system (Nonju & Ihua-Maduenyi, 2024; Stéphanie Laulhé & Yulia, 2024; Trang et al., 2024). Thus, AI applications in the field of penology not only increase accuracy in analysis and prediction but also make it possible to personalize justice, enhance the effectiveness of social interventions, and optimize judicial resources. Nonetheless, these tools must be developed within ethical and legal frameworks to prevent negative consequences such as algorithmic discrimination or violations of human rights (Rajaei & Amiri, 2025; Zuwanda et al., 2024).

7. AI Tools for Predicting the Effectiveness of Alternatives to Imprisonment

In recent decades, criminal justice systems in many countries, including Iran and Turkey, have moved toward using alternatives to imprisonment—such as community service, electronic monitoring, skills training, and psycho-social interventions. This shift is driven by goals such as reducing prison overcrowding, enhancing rehabilitation, lowering social costs, and promoting criminal justice. However, the central question is whether all alternative sanctions are effective for all offenders or under all conditions. At this point, AI tools can play a key role by analyzing historical data, identifying relevant indicators, and predicting the probability of success of alternative sanctions for specific individuals (Pasupuleti, 2024; Pires, 2024; Roman, 2025).

In what follows, four main components are explained: (1) models for predicting punishment effectiveness, (2) AI-based judicial decision-support systems, (3) policy optimization and model learning, and (4) feedback analysis and dynamic learning. Legal and ethical challenges associated with these tools are also discussed (Parsa, 2024; Stéphanie Laulhé & Yulia, 2024).

7.1. Models for Predicting Punishment Effectiveness

One of the most important applications of AI in the criminal field is designing "models for predicting the effectiveness of alternative punishments." These models are built using historical data—including the type of sanction imposed, offender characteristics (criminal history, social status, treatment history, psychological indices), and post-sentence outcomes (such as recidivism rate, income after release, and employment status)—in order to estimate the probability that an alternative sanction will be successful for a particular individual (Jalali, 2024; Rafiq, 2024). For instance, a model might determine that for an individual with the profile "30-year-old male, two prior non-violent convictions, no stable employment, previous treatment intervention," the probability of success for "electronic monitoring combined with skills training" is 75%, whereas the probability of success for "short-term imprisonment" is 50%. Such estimates help decision-makers (judges, social workers) select more effective sanctions (Nazemnejad, 2024).

However, as shown in recidivism prediction studies, the validity of such models depends on data quality, the representativeness of different groups, and mechanisms for combating bias. Fairness-focused research indicates that even risk-assessment models predicting recidivism (rather than the success of alternative sanctions) face conflicts between competing fairness criteria and may reproduce social inequalities (Nonju & Ihua-Maduenyi, 2024; Trang et al., 2024). For alternative sanctions, these models should consider not only the probability of reoffending but also specific indicators such as post-release employment, mental health, community satisfaction, and reduction of public expenditures—requiring the development of a comprehensive "punishment effectiveness index" (Roman, 2025; Zuwanda et al., 2024).

7.2. Judicial Decision-Support Systems

After predictive models are developed, the next step is designing "AI-based judicial decision-support systems." These systems allow judges, prosecutors, or social workers to view several alternative-sentence options along with estimated success probabilities before issuing a judgment or selecting a sanction. For example, the system may receive inputs such as gender, type of offense, age at commission, employment history, treatment coverage, and the offender's social network, and then provide outputs such as:

Option 1: "Electronic monitoring + psychological intervention," estimated success probability 80%

Option 2: "Community service + skills apprenticeship," estimated success probability 65%

Option 3: "Short-term imprisonment," estimated success probability 45%

In addition, the system can explain *why* Option 1 is recommended—for instance, due to the efficiency of skills training in similar cases and the offender's partial prior employment. This explanatory feature enhances judges' trust and decision transparency (Pasupuleti, 2024; Rafiq, 2024). Studies examining judicial resistance to risk-assessment tools suggest that one key reason for limited use is the lack of explainability and organizational fit (Parsa, 2024). Therefore, judicial decision-support systems are neither a substitute for judicial rulings nor merely automatic tools; they function as auxiliary aids for decision-makers, while the final decision remains with the human authorities (Rajaei & Amiri, 2025; Roman, 2025).

7.3. Policy Optimization and Model Learning

Predictive and decision-support tools, when combined with continuous learning, pave the way for "optimization of criminal policy." At this stage, AI algorithms can, using reinforcement learning or multi-objective optimization techniques, determine which combination of alternative sanctions and interventions has been most effective for specific categories of offenders over time. For example, the system might discover that for offenders with a history of drug use and limited employment experience, the combination of "electronic monitoring + skills training + psychological intervention" consistently yields better outcomes than simpler options. Consequently, policymakers can adjust legal frameworks, sentencing guidelines, and implementation

programs based on data-driven analysis (Pasupuleti, 2024; Pires, 2024). Reports on AI in criminal justice emphasize that one of the prerequisites for success is the ability to "update and adapt models to changing conditions" (Roman, 2025). Thus, AI enables criminal policy to move from a static state to a dynamic and adaptive one.

7.4. Feedback Analysis and Dynamic Learning

One of the keys to effective AI tools is a continuous feedback and learning process. After an alternative sanction is implemented, real-world data on the individual's status—such as employment, social relationships, post-sentence behavior, and recidivism—must be fed back into the model so that predictions can be refined and the model improved. For example, if the model initially predicted that "electronic monitoring + skills training" would have an 80% chance of success for a specific individual, but in reality the person remained unemployed and reoffended, these data must be integrated into the model to update its parameters and improve future predictions under similar conditions (Jalali, 2024; Nazemnejad, 2024).

This feedback cycle ensures that criminal justice decisions are made not only on the basis of historical records but also in light of up-to-date information about offenders and the real outcomes of interventions. This is particularly important in systems with extensive, high-quality data infrastructures (such as many developed countries), but it is equally relevant for countries like Iran and Turkey, which are still in the process of strengthening their data-driven infrastructures (Parsa, 2024; Zakerinia & Gholampour, 2024).

7.5. Legal and Ethical Challenges and Considerations

Despite the high potential of AI tools in predicting the effectiveness of alternative sanctions, several important challenges and considerations must be addressed before their widespread use. First, *justice and algorithmic bias*: algorithms trained on historical data may reproduce existing biases and produce discriminatory predictions. Research has shown that risk-assessment tools can incorrectly classify minority groups or individuals with lower education levels as more dangerous (Nonju & Ihua-Maduenyi, 2024; Trang et al., 2024). Second, *transparency and explainability*: in judicial processes, decisions must be justifiable, which requires AI models to be explainable. Lack of transparency can lead to public distrust and reduced effectiveness (Stéphanie Laulhé & Yulia, 2024).

Third, *responsibility and human oversight*: systems that provide recommendations to judges or social workers must not be the final decision-makers; human involvement in the loop is indispensable. Scholars emphasize the need for institutions to ensure human oversight, transparent policies, and appropriate training for staff when using AI tools in justice systems (Rafiq, 2024; Roman, 2025). Fourth, *privacy and data quality*: collecting personal, psychological, and social data requires robust legal and ethical frameworks. In many systems, data are incomplete, fragmented, or of low quality, which can lead to errors in prediction (Rezaeipour, 2024). Finally, *technical limitations and uncertainty*: even the best AI models are fallible. It is therefore recommended that judicial decisions not be based solely on AI models but rather on a combination of data, human expertise, and legal assessment (Parsa, 2024; Zuwanda et al., 2024).

Accordingly, AI tools can significantly enhance the effectiveness of alternatives to imprisonment through predictive models, decision-support systems, policy optimization, and dynamic learning. Yet for these technologies to be used responsibly and sustainably, comprehensive legal, regulatory, and ethical frameworks must be designed and implemented. Ultimately, data-driven criminal justice should not replace human justice but should strengthen and support it.

8. AI Tools for Identifying Offender Personality in Order to Implement Individualized Sentencing Policies

In recent decades, the development of AI technologies in various fields of the humanities and social sciences, including criminal law and criminology, has had a significant impact. In modern criminal policy, one of the fundamental pillars is individualized sentencing; that is, punishment should be determined based on the offender's personality, psychological and social characteristics, and personal history, rather than merely on the legal classification of the offense. The aim of individualization is to ensure that the criminal response corresponds to the offender's personality and his or her capacity for

reform (Parsa, 2024; Rajaei & Amiri, 2024). In this context, AI—with its ability to analyze extensive datasets and learn from complex behavioral patterns—has become an effective tool for more accurately identifying the offender's personality and predicting future behavior (Jalali, 2024; Nazemnejad, 2024).

8.1. The Role of Artificial Intelligence in Offender Personality Profiling

Machine learning and data-mining algorithms can, by analyzing psychological, social, and criminal data, construct an "individual personality profile" of the offender. Input data may include prior convictions, psychometric test results, psychological interview reports, and even linguistic analysis of the suspect's speech (Jalali, 2024; Roman, 2025). For example, research using clustering and deep learning methods has proposed transparent and low-bias frameworks for analyzing offender personality, grouping offenders with similar psychological and social characteristics together in comparable clusters (Nazemnejad, 2024). Such models not only enable more accurate prediction of future behavior but, by using explanatory techniques, show which factors—such as age, marital status, or employment history—play the greatest role in the formation of criminal behavior (Nonju & Ihua-Maduenyi, 2024; Pasupuleti, 2024). These systems can serve as decision-support tools for judges or social workers, enabling them to select punishments that correspond more closely to the offender's personality; for instance, an individual with high aggression and poor emotional regulation needs psychotherapeutic interventions rather than merely a short term of imprisonment (Rafiq, 2024; Rajaei & Amiri, 2025).

8.2. Predicting Recidivism

One of the most important achievements of AI in the field of criminal justice is the prediction of recidivism risk. Models such as COMPAS in the United States and similar tools in Turkey and Europe use thousands of case records to estimate the likelihood that a defendant will reoffend (Rafiq, 2024; Trang et al., 2024). Other studies emphasize that the use of recidivism prediction models can assist judges in choosing between two options—such as imposing an alternative sanction or imprisonment—by making the offender's social risk more transparent (Zuwanda et al., 2024).

In Iran, some scholars have proposed designing a similar system for analyzing criminal and social-work data, so that real data from prisons and probation services can be used to construct a recidivism risk pattern (Jalali, 2024). If such predictions are designed in a transparent and fair manner, they can improve the implementation of individualized policies, because judicial decisions will be based on scientific data rather than merely on subjective impressions (Parsa, 2024; Roman, 2025).

8.3. Environmental Analysis and Criminal Networks

One of the emerging branches of data-driven criminology is the use of network analysis. In this approach, AI examines offenders' social, familial, or group relationships and analyzes the influence of these networks on the formation of criminal personality. For example, if data show that an individual has committed offenses primarily in association with a particular criminal group, group-based interventions can be used to reform that person's social environment (Nazemnejad, 2024).

In Turkey, projects on the analysis of organized-crime networks are being implemented in cooperation between the police and technological universities, using clustering algorithms to identify crime hot spots and offender networks (Pires, 2024; Zuwanda et al., 2024). Such tools provide a more realistic picture of the offender's situational context and allow for policies that target not only the individual but also the criminal milieu.

8.4. Dynamic Monitoring and Assessment of Offender Personality

One of AI's outstanding features is its capacity for continuous learning. Intelligent systems can continue to monitor the offender's behavior and performance after sentencing and during sentence execution, incorporating new data into the model. For example, if an individual, after release, participates in skills-training programs or gains stable employment, the model can adjust its prediction of recidivism risk accordingly (Pasupuleti, 2024). This dynamic updating of models transforms

individualized sentencing from a static process (a decision made only at the time of judgment) into an ongoing and adaptive process.

Such frameworks are being experimented with in advanced jurisdictions, where feedback from post-sentence behavior is used to refine risk assessments and intervention strategies (Roman, 2025; Trang et al., 2024). In Turkey as well, discussions on smart supervision and data-driven rehabilitation policies have highlighted the potential role of AI in enabling continuous assessment rather than one-time classification of offenders (Nazemnejad, 2024; Parsa, 2024).

8.5. Ethical and Legal Challenges

Despite its many advantages, the use of AI in offender personality analysis is accompanied by a number of challenges:

1. **Algorithmic bias:** Algorithms may learn from biased data. If the training data contain discriminatory judgments, the model will reproduce the same prejudices (Nonju & Ihua-Maduenyi, 2024; Zuwanda et al., 2024). For instance, certain social or ethnic groups may be systematically classified as higher risk solely because of historical patterns embedded in the data.
2. **Lack of transparency in decisions:** Many deep-learning models function as "black boxes" and are not easily explainable. In criminal proceedings, where transparency and accountability are essential, this lack of explainability can be dangerous (Pasupuleti, 2024; Stéphanie Laulhé & Yulia, 2024).
3. **Privacy and data protection:** The collection of personal, psychological, and family data must be conducted under clear legal authorization and in accordance with data-protection principles. Otherwise, public trust in judicial fairness will be undermined (Bin Awda, 2022; Rezaeipour, 2024).

For these reasons, researchers emphasize that in legal systems such as those of Iran and Turkey, a robust legal and ethical framework for oversight, human control, and algorithmic explainability must be established before such tools are widely implemented (Parsa, 2024; Rajaei & Amiri, 2025).

Thus, AI can, by analyzing multidimensional data and behavioral patterns, identify offender personality with greater accuracy and thereby render the implementation of individualized sentencing policies more scientific and effective. Tools such as machine learning, neural networks, network analysis, and risk-prediction models can serve the aims of criminal justice; yet without human oversight, transparency, and adherence to ethical principles, these same tools may foster inequality and injustice. Consequently, the realization of data-driven justice requires the coexistence of technological innovation and the fundamental principles of human rights (Roman, 2025; Stéphanie Laulhé & Yulia, 2024).

9. Challenges of Applying Artificial Intelligence in Criminal Justice and Possible Solutions

The question of the extent to which artificial intelligence can play the role of human intelligence in the course of criminal investigations is highly complex. It is worth noting that AI can review, classify, and extract information from hours of video and other crime-related evidence without fatigue; this feature makes the investigation process more precise and saves time, although the functions of AI are accompanied by various challenges. Human-rights scholars have examined the challenges posed by AI for fundamental rights and have argued that sound policymaking in this field can mitigate the adverse impact of this technology on human rights (Parsa, 2024; Stéphanie Laulhé & Yulia, 2024). In an article published in *Harvard Business Review* in 2018 on the risks and benefits of using AI for crime detection, the authors pointed out that companies use AI to prevent and detect everyday employee theft—for example, individuals who disclose non-public and confidential stock-market information—and that banks employ AI to detect and prevent fraud and money laundering. Social media companies likewise use such tools to stop the dissemination of illegal content, such as child pornography. In practice, corporations are exploring new ways of using AI in risk management and prevention of criminal behavior. For example, in financial markets, AI can detect unjustified increases in share prices and thereby help prevent unlawful conduct in international trade (Pasupuleti, 2024; Zuwanda et al., 2024).

The use of AI to infer information from suspects is also confronted with challenges. One of the key advantages of using AI in extracting information from suspects is its high accuracy and ability to distinguish between different individuals. AI can,

with a high degree of precision and without inherent bias, identify information related to each person—at least in principle. At the same time, the use of AI for drawing inferences about suspects requires protection of privacy. It must be ensured that the personal data of suspects are used confidentially and with full respect for their individual rights (Nonju & Ihua-Maduenyi, 2024; Rezaeipour, 2024). Another challenge is that, in many cases, AI needs to interact with humans in order to obtain and interpret the necessary information correctly; effective and efficient human–AI interaction therefore becomes a crucial issue when using AI to extract information from suspects. A further challenge concerns the interpretation of information: AI systems must be interpretable in the sense that their inferential and decision-making processes can be understood by humans, since the judicial authorities ultimately make the decisions and the resulting reports must be reasoned and interpretable in court (Rajaei & Amiri, 2025; Roman, 2025).

The use of AI in the preliminary-investigation stage can likewise be associated with risks and challenges. AI requires the analysis of large and diverse datasets. If these data are incomplete, unreliable, or biased, this may lead to errors and inaccuracies in AI-based analyses. The design of opportunistic or biased models that undermine fair-trial guarantees and the principles of independence and impartiality can directly threaten judicial independence and fairness (Stéphanie Laulhé & Yulia, 2024; Zuwanda et al., 2024). Excessive reliance on AI outputs can also be dangerous and may lead to loss of neutrality and the occurrence of error. At the same time, AI has many positive features, such as reducing opportunities for bribery and judicial corruption (Bin Awda, 2022). Accordingly, solutions such as the use of data-cleaning methods and a strong emphasis on data quality can improve the accuracy and reliability of AI-based results. In some cases, data may conflict and lead to incorrect outcomes; in such situations, the use of data-matching and consistency algorithms can be helpful. AI may also detect patterns in data that are not intuitively interpretable by humans, making it difficult to interpret results and take appropriate decisions. Using interpretable algorithms and strengthening human–AI interaction can help address these challenges (Jalali, 2024; Nazemnejad, 2024). The deployment of AI in preliminary investigations may also have social and legal implications, which makes it necessary to adopt suitable laws and policies to prevent misuse or undesirable consequences. When appropriate safeguards are in place, AI can bring about significant improvements at the preliminary-investigation stage (Parsa, 2024; Rafiq, 2024).

The use of AI in adjudication can, for several reasons, lead to a reduction in human workforce, because AI is able to perform repetitive and time-consuming tasks previously carried out by humans. For instance, in the process of analyzing and classifying legal documents, AI can automatically extract and categorize information, resulting in time savings and reduced need for human resources. In addition, by using advanced algorithms and deep learning, AI can support more accurate and effective decision-making in adjudication, thereby increasing efficiency, precision, speed, and reducing errors in judicial processes, which ultimately contributes to the realization of criminal justice (Oluwaseye et al., 2024; Pires, 2024). However, the use of AI in adjudication requires compliance with legal, ethical, and security requirements. Side effects such as increased workload for remaining staff, concerns about individual rights, and privacy protection must also be taken into account. In light of the benefits and challenges outlined above, the use of AI in adjudication must be approached with caution and with due regard to all relevant dimensions—including legal, ethical, and security aspects—so as to achieve the best results and respond to society's needs (Parsa, 2024; Stéphanie Laulhé & Yulia, 2024).

The use of AI in police investigations and during trial proceedings may give rise to issues of compensation and civil liability. AI may, for various reasons, generate erroneous decisions that result in civil liability for police authorities or courts and lead to violations of personal rights, privacy, and security, thereby giving rise to claims for damages (Bin Awda, 2022; Zakerinia & Gholampour, 2024). Misuse of AI may cause public dissatisfaction with the judicial system and, ultimately, civil liability and compensation claims. Thus, despite its advantages, AI may cause harm, raising the question of how such damage should be compensated. It seems necessary, in this regard, to establish insurance mechanisms and compensation funds so that suspects' rights are not infringed and that those harmed by AI-related errors can be adequately compensated (Rezaeipour, 2024; Roman, 2025).

The use of AI in police investigations and suspect interrogation may also confront various legal challenges. Using AI to analyze data and information related to suspects may result in violations of their privacy; therefore, it must be ensured that

sensitive information about suspects is properly protected and safeguarded against unauthorized access (Nonju & Ihua-Maduenyi, 2024). Another challenge concerns the legal consequences of such use: AI-based investigative methods must comply with applicable legal norms, and it must be guaranteed that their deployment in police investigations is fully compatible with suspects' rights and relevant criminal-law provisions (Parsa, 2024; Rajaei & Amiri, 2024). A further challenge is ethical: the use of AI in police investigations may raise serious ethical concerns, making it necessary to ensure that AI-based procedures are implemented fairly and equitably and that human rights are respected. Transparency and public trust constitute another key issue: the use of AI in police investigations must be transparent and trustworthy so that public confidence in the investigative process is maintained and the outcomes are accepted as legitimate. With appropriate safeguards, the efficiency and effectiveness of AI in police investigations can be enhanced, leading to significant achievements (Rafiq, 2024; Zuwanda et al., 2024).

The privacy challenge in the use of AI in police investigations can be addressed through the implementation of specific measures. One such measure is data encryption: strong encryption must be used to protect suspects' sensitive data, ensuring that personal and sensitive information is shielded from unauthorized access during processing and transmission (Nonju & Ihua-Maduenyi, 2024). Another solution is restricted access, meaning that only authorized persons—such as law-enforcement officers and judicial authorities—should have access to such data, thereby safeguarding privacy. To protect privacy, only data necessary for police investigations should be collected and used; unnecessary data must be completely deleted to prevent misuse or violations of individuals' privacy. Transparency and public information constitute another important measure: suspects and the broader public should be adequately informed about the use of AI in police investigations, including its effectiveness, modes of operation, and impact on privacy. In addition, independent bodies should be established to oversee and review the use of AI in police investigations; such oversight can help monitor activities, scrutinize decisions, and ensure compliance with the law and respect for suspects' rights (Parsa, 2024; Stéphanie Laulhé & Yulia, 2024). Police personnel must also receive appropriate training on privacy protection and the ethical use of AI, and such training must be regularly updated in line with technological developments. By following these measures, it is possible to preserve privacy in AI-assisted police investigations and to achieve an appropriate balance between technology and ethics grounded in human rights and criminal justice (Rezaeipour, 2024; Zuwanda et al., 2024).

To address other challenges of using AI in police investigations, additional solutions can be proposed. In this regard, laws on privacy protection in the use of AI must be updated to respond to new technological developments. Such legislation should safeguard suspects' rights and provide workable mechanisms for protecting privacy, including clear standards for data processing, storage, and sharing (Nonju & Ihua-Maduenyi, 2024; Parsa, 2024).

In the area of transparency, mechanisms must be designed to ensure meaningful interaction with natural persons and to guarantee transparency of AI operations so that users can interpret AI-generated results. Judicial bodies and law-enforcement agencies should therefore provide greater transparency regarding their use of AI in investigations, including appropriate public information for suspects and the wider community and clear explanations of the criteria and methods governing AI use (Stéphanie Laulhé & Yulia, 2024). Independent organizations and supervisory bodies should be established to monitor and review the use of AI in police investigations. These institutions would be responsible for overseeing AI deployment, examining police decisions and conduct, and ensuring respect for suspects' rights and privacy (Bin Awda, 2022; Zuwanda et al., 2024). Training law-enforcement officers in privacy protection and the ethical use of AI is also crucial; such training should include familiarity with relevant laws, procedures, and methods for protecting the privacy of suspects and complainants when AI is used (Oluwaseye et al., 2024). New technologies such as strong cryptography, blockchain, and privacy-preserving data technologies can further contribute to safeguarding privacy in AI-assisted investigations. Society itself should participate in decision-making processes concerning the use of AI in police investigations, for example through cooperation with civil-society organizations and human-rights institutions, so that privacy and suspects' rights are more effectively identified, articulated, and protected (Rajaei & Amiri, 2025; Zuwanda et al., 2024). By implementing these measures, privacy-related demands in AI-assisted investigations can be met, and an appropriate interaction between technology, human-rights–based ethics, and the realization of criminal justice can be achieved.

10. Conclusion

With the advancement of modern technologies, particularly artificial intelligence, the legal systems of Iran and Turkey are moving toward transformation and innovation in the evaluation and implementation of punishments. The integration of AI in this domain can enhance the efficiency of criminal procedures, increase accuracy in data analysis, and improve criminal justice policymaking. However, differences exist between the two countries regarding legal infrastructures and institutional readiness. In both jurisdictions, AI can play a significant role in analyzing crime patterns, predicting recidivism risk, and determining punishments proportionate to the personal circumstances of offenders. Turkey has taken more advanced steps in judicial digitalization compared to Iran, and systems such as UYAP (the National Judicial Informatics System) provide a suitable foundation for incorporating AI tools. In Iran, despite certain research initiatives, practical implementation of AI in criminal decision-making is still in its early stages and requires infrastructure development, legal reforms, and professional training for judges and judicial officials.

A central focus of this study has been the prediction of punishment effectiveness through AI-based models. By using extensive data on the historical outcomes of different sanctions, AI can estimate the likelihood of success or failure of alternative punishments before a judgment is issued. This allows the judiciary to rely on scientific and data-driven tools in decision-making and avoid ineffective or costly sanctions. In leading countries, including Turkey, such models are being developed as decision-support systems, combining data analytics with human judgment to improve the effectiveness of criminal justice.

Modern tools for identifying the offender's personality—from data-driven analyses to deep learning models—can generate more accurate profiles of offenders' psychological, social, and moral characteristics. By integrating biological, behavioral, judicial, and psychological information, these tools enable more precise individualized sentencing. Thus, judges or social workers can determine sanctions based on the true personality and rehabilitative needs of offenders, rather than merely the type of crime. This shift moves criminal policy from a generalized punitive approach toward a personalized and rehabilitative model. Accordingly, AI helps balance "criminal justice" and "social efficiency" by both identifying the roots of criminal behavior and forecasting the effectiveness of various punishments. This shift represents a transition from reactive justice toward proactive and reform-oriented justice. Nevertheless, achieving such aims requires compliance with ethical and legal principles. Although AI can increase the precision of criminal decisions, absent human oversight and transparent frameworks, risks such as bias, privacy violations, and discriminatory outcomes remain significant.

Thus, based on the discussions presented, the use of AI in evaluating the effectiveness of punishments in Iranian and Turkish law represents a new opportunity for improving criminal justice. However, its success depends on integrating technology with foundational legal principles, ensuring algorithmic transparency, and aligning implementation with the social and cultural structure of each country. While Turkey has taken more decisive steps in this direction, Iran can also progress through gradual reforms and strategic investment in AI within the criminal justice sector. Ultimately, AI is not a substitute for human decision-makers but rather a tool for empowering human justice—one that, when applied properly and with oversight, can facilitate the transition from punishment-oriented systems to rehabilitation-oriented ones and guide the criminal justice system toward more effective, humane, and evidence-based justice.

Ethical Considerations

All procedures performed in this study were under the ethical standards.

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Conflict of Interest

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