بسم الله الرحمن الرحيم

Smart Robots and Their Role in the Judicial System

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Abstract

Modern judicial systems are undergoing significant transformations due to the advancement of artificial intelligence and the emergence of so-called smart robots, which are increasingly integrated into core judicial functions—particularly in areas such as judicial oversight, information gathering, and data analysis. This study focuses on examining the legality and constitutionality of employing smart robots in procedures of a judicial nature, especially those affecting individual rights and freedoms, such as the sanctity of homes and personal privacy. The research problem arises from growing concerns over the legal and ethical implications of this technological intervention and the absence of clear legislation regulating the relationship between technological advancement and the requirements of criminal justice. The study aims to clarify the conceptual and legal framework of smart robots, analyze the challenges associated with their use, and review comparative international experiences in this field. The findings suggest that while these technologies may contribute to achieving fast and effective digital justice, they often lack human discretion and judicial insight, necessitating strict legal safeguards to ensure respect for constitutional guarantees and the preservation of justice principles. The study recommends the urgent development of legislative frameworks to regulate such use and the imposition of human oversight into the outputs of these systems to ensure a balance between security effectiveness and the protection of fundamental rights.

Keywords: Smart robots, artificial intelligence, judicial system, criminal justice, rights and freedoms, constitutional guarantees, algorithmic bias, legal regulation of modern technologies.

Introduction

In recent decades, the world has witnessed a significant leap in the fields of artificial intelligence and smart systems. Robots are no longer confined to industrial or service tasks; rather, their use has expanded into more sensitive and complex domains, including the judicial field. With the development of so-called "smart robots"— those capable of learning, analyzing, and making decisions with a degree of autonomy—legal and ethical questions have emerged regarding their legitimacy and role within the justice system, particularly in the operations of the judiciary.

As a result, some judicial systems around the world have begun experimenting with the deployment of smart robots in tasks related to information gathering, movement monitoring, and even behavior pattern analysis. These applications aim to support judicial processes and enable law enforcement agencies to access accurate information swiftly. However, this remarkable technological development is accompanied by numerous challenges concerning individual rights and fundamental freedoms, as well as the ex tent to which such intelligent systems adhere to constitutional safeguards and due process requirements.

Problem Statement

With the rapid advancement of artificial intelligence technologies, it has become feasible to assign certain judicial oversight functions to smart robots, which are distinguished by their ability to collect and analyze data and make preliminary decisions in record time. This new technological reality raises a fundamental legal issue: the legitimacy of robotic intervention in judicial functions, especially when it infringes upon individuals' rights and the constitutional guarantees governing criminal procedures. Despite the benefits smart robots offer in terms of efficiency, speed, and reduction of human error, their use in judicial tasks—particularly those affecting personal freedom, privacy, the sanctity of homes, and confidentiality of correspondence—may result in overreach or abuse unless governed by a precise and clear legal framework.

Accordingly, the central question of this study is: *To what extent is the use of smart robots in judicial operations legitimate and constitutional, and what legal frameworks are necessary to regulate such use while ensuring a balance between public security and the protection of individual rights and freedoms?*

This main question gives rise to several sub-questions, including:

1. What is the conceptual and legal framework of smart robots?

2. What are the limits of robotic involvement in judicial functions?

3. What legal safeguards must be in place when using artificial intelligence in the judicial system?

4. How have comparative legal systems addressed this development, and what regulatory measures have been proposed to prevent abuse or deviation in the performance of these systems?

Significance of Study

The significance of this study lies in its exploration of a contemporary and nuanced issue at the intersection of artificial intelligence and criminal law—the use of smart robots in judicial functions. This subject remains in its formative stages from both a legal and regulatory perspective, particularly within Arab legal systems.

Methodology of the Study

The study adopts a descriptive-analytical methodology, by describing the legal texts related to smart robots and their role in judicial operations under Jordanian law. It also reviews relevant jurisprudential opinions and judicial applications, analyzing these texts and perspectives in depth to understand their meanings and interpretations. This approach contributes to clarifying how such laws may be applied in the real-world legal context.

Chapter One

First: The Concept of Smart Robots

Before delving into the definition of a robot, it is necessary first to explore the concept of artificial intelligence, as it constitutes the technical and scientific foundation upon which modern robotic systems are built. Many robotic functions rely fundamentally on AI technologies—whether in data processing, decision-making, or interaction with the surrounding environment.

Artificial intelligence is defined as a system's ability to accurately interpret external data, learn from it, and apply the acquired knowledge to achieve specific goals and tasks through flexible adaptation to changes.[1] It is also described as a branch of computer science aimed at developing advanced tools to program computers in a way that enables them to make inferences and perform tasks resembling—at least to some extent—the human capabilities associated with intelligence.[2]

Intelligent Robots—also referred to as Autonomous Robots or Advanced Robots—is a term used by scientists to describe a generation of robots capable of adapting to changes in their surrounding environments. One of their most prominent features is their diversity; these robots do not conform to a single model. Rather, they differ in form, type, and field of application. Some resemble humans or animals, while others are designed for service, professional, or manual functions. Additionally, they play roles in educational, recreational, and other domains.[3]

Thus, robots have become, at present, collaborators with humans across various vital sectors, most notably in education, healthcare, industry, justice, and the economy. These sectors serve as clear examples of the expanding scope of robotic applications. Though not exhaustive, they are sufficient to demonstrate the widespread adoption of this technology across many areas of life.[4]

Returning to the concept of the "smart robot," we find that it is the result of a series of accumulated technological developments that have brought us to the threshold of a new phase of the industrial revolution. This ever-evolving revolution proceeds in successive stages, each distinguished from the last by qualitative shifts in the tools

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[1] Andreas Kaplan and Michael Haenlein, (2019). Siri, Siri, in my hand: Who's the fairest in the land? On the interpretations, illustrations, and implications of artificial intelligence, Business Horizons, Volume 62, Issue 1, January-February, 2019, pp. 15-25, p.17.

[2] Khalifa, E. (2017). The escape of artificial intelligence from human control: Risks and threats. Future for Advanced Research and Studies Center.

[3] Droit et réglementation des activités de robotique". 2018 ffhal-01911625f. Submitted on 2 Nov 2018, p. 3

[4] Jahilul, A. H. K., & Oudah, H. A. (2019). *Civil liability for damages caused by robots: A comparative analytical study*. Al-Tariq Journal for Education and Social Sciences, 1, 738. Imam Al-Kadhim College.

and methods of production. What sets this current phase apart is the transition from traditional mechanical machines—entirely operated by humans—to intelligent systems capable of functioning independently, thanks to the advanced processing, learning, and decision-making capabilities enabled by artificial intelligence.[5]

A robot has elsewhere been defined as a machine capable of performing pre-programmed tasks, either through direct human control or indirectly through computer software that directs its performance and determines its behavior.[6]

A **smart robot**, in turn, has been defined as: an intelligent machine that operates autonomously and independently by simulating an artificial cognitive system, aimed at executing highly precise tasks across various sectors such as medicine, administration, transportation, and other vital areas.[7]

The robot (Arabic: *al-Insālah*) is considered an advanced application of artificial intelligence, as AI has come remarkably close to human intelligence. The closer this resemblance becomes; the more legal questions are raised—especially since the similarity lies not only in motion and behavior but also in reasoning. Therefore, many countries have rushed to develop legal frameworks suitable for this emerging phenomenon, including Japan, South Korea, and more recently the European Union. Their aim is to regulate the use of robots and artificial intelligence within the broader process of artificial exploitation, ensuring the highest professional standards. These efforts also seek to define the legal status of robots, address the issue of legal personality, and establish a shared European definition for categories of intelligent and autonomous robots, including the adoption of a "synthetic registry" system for robot identification.[8]

Second: **Applications for Using Intelligent Robots in the Judicial System**

Modern technologies, especially artificial intelligence, are among the most influential factors driving the continuous evolution of judicial systems around the world. With rapid advancements in this field, many countries have begun exploring the use of intelligent robots and AI-powered systems to deliver legal services and

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[5] Hari, S. (2020). *Artificial intelligence and law: An overview*. Dubai Judicial Institute Journal, Emirate of Dubai, United Arab Emirates, 11(8), 181.

[6] Al-Khatib, M. I. (2018). *The legal status of robots: Personality and responsibility – A comparative fundamental study*. Kuwait International Law School Journal, 1(4), 98.

[7] Al-Qousi, H. (2018). *The dilemma of the person responsible for operating the robot: The impact of the "human proxy" theory on the future viability of the law – A foresight analytical study in European civil law rules on robotics*. Jil Journal for In-Depth Legal Research, 3(25), 79.

[8] Al-Khatib, M. I. (2018). *Guarantees of the right in the digital age: From changing the concept to changing the protection – A reading of the European and French legislative positions with a reflection on the Kuwaiti legislative stance*. Kuwait International Law School Journal, Issue 3, Part 1, 284.

enhance judicial procedures. These technologies aim to expedite litigation processes, reduce costs, and achieve greater accuracy in judicial decision-making.

This **section** explores the practical applications of intelligent robots within judicial systems, with a focus on the experiences of leading countries in this field such as the United States and China. It also addresses the development of these technologies in delivering legal consultations, simulating court judgments, and improving the overall efficiency of judicial systems.

1. Experiences of Countries in Using Artificial Intelligence in Litigation

Some countries have harnessed artificial intelligence in the legal domain, with the United States taking the lead by launching the "robot lawyer" project—an intelligent system that provides legal information and interacts with users in a human-like manner. Private companies have also begun offering advanced legal services that grant access to legal information, court rulings, and legal precedents with ease, using technologies capable of predicting judicial outcomes in what is known as "predictive justice."[9]

In China, authorities announced a significant development in December 2019 with the introduction of "Internet Courts," which adjudicate millions of cases without requiring parties to be physically present. These courts rely on non-human judges supported by AI technologies, allowing parties to file cases electronically and participate in virtual hearings. These courts handle a wide array of disputes, including intellectual property cases, e-commerce issues, financial conflicts, product liability claims, and some administrative disputes. In Beijing, the average duration of a case is about 40 days, while each hearing typically lasts no more than 37 minutes. Statistics show that 80% of litigants before these courts are individuals, while 20% are legal entities. Notably, 98% of the issued rulings have been accepted without appeal.[10]

AI can also be used through capacity-building programs, which serve as effective tools for improving judicial performance, especially in light of the digital transformations within the justice sector. Due to the novelty of AI, its numerous functions, and the variety of tasks it can perform, multiple definitions have emerged regarding its nature. Nonetheless, it is ultimately understood as a technology that enables machines to think and perform tasks in a way that mimics human behavior,

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[9]Abdel-Motleb, M. A. H. (2020). *Artificial intelligence algorithms and the salvation of law* (1st ed.). Dar Al-Nahda Al-Arabia, Cairo, 52.

[10] Ahmed, F. A. A. H. (2023). *The role of artificial intelligence in enhancing swift justice before the judiciary: A comparative study* (master's thesis). Qatar University, College of Law, 45.

through training with algorithms that allow for continuous data analysis and learning.

International documents have paid special attention to defining this concept. In this context, the United Nations Commission on International Trade Law (UNCITRAL) noted in one of its memorandums that artificial intelligence is a science concerned with the creation of systems capable of solving problems and performing tasks by simulating human cognitive processes. These systems are characterized by their self-learning capabilities, either by being taught specific solutions or by independently devising them. Some of these systems exhibit varying levels of autonomy and self-operation, to the extent that their actions and outcomes may become unpredictable due to what is known as the "black box" phenomenon.

This development has had tangible effects in some judicial systems, particularly in China, where AI was directly introduced in the criminal justice field in Pudong district to replace the role of the public prosecution. The system's declared decision accuracy reached approximately 97%. In the United States, AI has also been integrated into judicial practice through technologies such as the **Public Safety Assessment (PSA)**, which helps judges make decisions regarding detention or release of individuals. In Canada—specifically in Vancouver—the **Civil Resolution Tribunal** was established, enabling citizens to independently initiate litigation procedures via an open online platform without the need for physical court appearances.[11]

The "Robot Lawyer" as a Leading Application of Modern Technology in the Legal Field, which is one of the most prominent applications of modern technology in the legal field, relying on artificial intelligence (AI) techniques to provide legal services as an alternative to those offered by human lawyers. In some cases, human lawyers may face limitations related to time, geographical location, or financial resources. This innovation aims to expand access to justice by offering more flexible and efficient legal services to individuals and businesses. The robot lawyer operates by analyzing legal cases and predicting their outcomes using advanced algorithms for legal data analysis, allowing it to provide accurate recommendations to clients, while also reducing the costs associated with traditional legal services.

The increasing reliance on this technology is attributed to its speed and accuracy in processing data, as well as its contribution to alleviating the burden on lawyers and improving efficiency within legal institutions. However, the robot lawyer is not without challenges. The nature of legal work is complex, involving negotiation and the need for human understanding of cultural and social context. Discretionary skills,

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[11] Sha'er, I. A. (2024). *The judge in the age of artificial intelligence: From the luxury of access to the obligation of capacity building.* Journal of Zarqa University for Legal Studies, Special Issue, 239-241.

accumulated experience, and personal legal intuition remain elements that are difficult to fully replicate by an intelligent system. Furthermore, there are other risks related to privacy and data protection, necessitating the use of licensed software that is regularly updated to ensure compliance with legal and ethical standards.[12]

Despite these challenges, the robot lawyer is viewed as a transformative step in the legal services field, offering the potential for round-the-clock access to legal support and flexible scheduling for case analysis and advice. This innovation is expected to bring about a significant shift in how legal services are provided in the future, provided it is employed with caution and precision to ensure the best possible legal outcomes. In this context, **Legal Robot**, based in San Francisco, stands out as one of the leading companies in the field of legal AI. The company currently offers advanced contract analysis in a trial phase, using machine learning and AI techniques to convert legal content into a digital format, with the ability to identify potential legal issues within documents, responding to the growing market demand for effective contract review tools.[13]

2. Predictive Smart Policing

Smart policing refers to the use of information and communication technology, including intelligent applications and software, to combat and reduce crime. It serves as a fundamental pillar in the development of smart cities and ensures sustainability. It is worth noting that predictive policing projects in the United States are implemented by local police departments through strategic partnerships with the private sector and federal agencies. The Los Angeles Police Department (LAPD) is a leader in this field, having collaborated with federal agencies since 2008. The LAPD has implemented a variety of predictive policing programs, such as the LASER program, which aims to identify areas likely to experience gun violence, and the PredPol program, which focuses on identifying high-risk areas for property-related crimes.

Although the LASER program was discontinued in 2019, and some police departments stopped using the PredPol program due to issues that arose during its application, these programs have proven effective in reducing crime. On the other hand, the New York Police Department (NYPD), one of the largest police forces in the United States, began testing predictive policing programs in 2012, collaborating with private companies such as Azalea, Key Stats, and PredPol. In 2013, the NYPD developed its own predictive algorithms, relying on data related to major crime

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[12] Awad, A. F. A. (2024). *The future of justice in the age of artificial intelligence: Between the "robot" judge & lawyer*. Special Issue – 8th International Scientific Conference (Technology and Law), Faculty of Law, Ain Shams University, 2350.

[13] Awad, A. F. A. (2024). *Ibid.*, 2355.

complaints, gunfire incidents, and emergency 911 calls concerning gunfire. These predictive algorithms successfully reduced various crimes, including shootings, robberies, criminal assaults, and vehicle thefts, while also helping in the allocation of officers to monitor specific areas based on the data derived from these algorithms.[14]

In addition to the use of artificial intelligence as a preventive measure in France through the implementation of electronic bracelets to enforce restraining orders, as stipulated in Law No. 1161 of 2020 issued on September 23, 2020, regarding the application of an electronic device to prevent approaching victims or specific locations.[15]

Third: Challenges of Using Smart Robots in the Judicial System

Although artificial intelligence (AI) systems and smart robots are known for their speed and high accuracy in performing tasks, they lack the ability to make sound judgments or handle unexpected situations. When these systems encounter scenarios outside the scope of their training, their performance significantly declines, leading to a loss of efficiency. This contrasts with the human brain, which has the capacity to understand, use intuition, and draw on past experiences to make appropriate decisions. Additionally, the human mind is distinguished by wisdom, which is difficult to replicate programmatically or artificially. This makes human interaction in the judiciary more flexible and profound than automated systems. Furthermore, AI systems can be vulnerable to deception, as demonstrated by some experiments in which researchers were able to mislead self-driving cars using camouflage stickers on the road, causing them to alter their course inaccurately. This does not usually happen with a human driver who could distinguish between what is true and what is deceptive.

Thus, AI, at least for now, is considered a supporting tool rather than a replacement for judges. It aims to assist judges by reducing workloads and speeding up legal

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[14] Abdelhamid, E. D. M. K. (2023). *Smart police and its role in crime control in the UAE society*. Journal of Human and Social Sciences, 50(6), 103-106.

[15] Dessouki, Mona Mohamed Al-Atrisiy. Crimes of Artificial Intelligence Technologies and the Independent Electronic Legal Personality: A Comparative Study. Previously cited reference, p. 1171.

proceedings to achieve more efficient and accurate justice. However, AI remains reliant on the human mind that designed, programmed, and provided it with data. It cannot evolve or surpass its capabilities without human intervention at each stage of its operation and development.[16]

The idea of replacing human judges with smart robots is rejected, primarily because technology is not free from flaws and may suffer from the same limitations as humans. AI systems, computers, and legal robots are all human-made, and therefore, they may carry over the biases of their creators or trainers. For example, studies have shown that facial recognition programs often subject people with darker skin to higher scrutiny than white individuals, increasing the likelihood of illegal stops and searches. This reflects the potential for AI systems to inherit racial discrimination embedded in their data or algorithms.

On the other hand, automated judges may lack transparency. While human judges can explain the reasons for their decisions and justify the conclusions they reach based on the case details, algorithms or AI systems cannot clarify the exact reasons behind a decision or express the subtle differences or emotional and social factors that may influence the judgment. Judiciary inherently requires a deep understanding of human context and the ability to interact with the social and psychological aspects of the litigants, qualities that are "uniquely human" and difficult to program. Therefore, legal proceedings overseen by human judges are considered more just, as they enhance the sense of procedural fairness, unlike sessions managed by AI systems, which lack the essential human dimension necessary for achieving justice.[17]

In addition to the risk of discrimination and bias in data analysis through predictive justice, criminal prediction systems are considered one of the outcomes of artificial intelligence. These systems rely on algorithms to predict crimes before they occur by utilizing statistical concepts and big data analysis to identify patterns and correlations. This process produces results based on vast datasets fed into artificial intelligence applications. The relationship between data volume and predictive capacity is directly proportional, the more data available, the easier it becomes to make predictions. Although these systems may appear secure and contribute to

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[16]Al-Jalloud, A. B. A. R. B. O. (2023). *The legal rulings on the application of artificial intelligence in the judiciary.* Saudi Judicial Scientific Association, 1st ed., 178.

[17] Badawi, A. T. B. M. (2024). *The use of smart robots equipped with artificial intelligence in the judicial system (robotic justice).* Paper presented at the 23rd Annual International Conference on the Legal and Economic Dimensions of the Litigation System in the 21st Century, April 21-22, 820.

public safety and justice, their results are not free from errors, as highlighted by the RAND report on predictive policing technologies[18].

The primary concerns revolve around the possibility of algorithms convicting individuals who have not yet committed any crime, which could lead to the unfair targeting of people of color. These issues raise significant doubts about what is known as algorithmic justice, which aims to identify and predict criminal acts before they occur. However, such systems inherently carry numerous risks, including inaccuracies in outcome predictions. These inaccuracies often stem from the introduction of biased or incorrect data, which may be a consequence of human bias. Human bias can influence the selection of training data used for algorithms, leading to computational biases that magnify existing human prejudices[19].

An example of the potential for discriminatory decision-making resulting from automated data processing is reflected in decisions made by the COMPAS software, which is designed to assess the risk of recidivism under certain circumstances. This algorithm was developed by a private company and is used by judges in several U.S. states. The program consists of 137 questions answered by the defendant or filled based on the information contained in the criminal case file. These questions cover a wide range of topics, and the algorithm assigns the individual a score ranging from 1 to 10, with 1 indicating a lower risk and 10 indicating a higher risk of reoffending. This score serves as a tool to assist in judicial decision-making. However, the COMPAS system has been shown to classify African American citizens at nearly double the risk of recidivism compared to their white counterparts. The study demonstrated that the system was **77% more likely** to label Black defendants as high-risk compared to white defendants[20].

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[18] Qaraza, Balqis & Qasaa, Souad. (2022). "Digital Bias in Artificial Intelligence Systems." Organized by the University Center Si El Haouas, Barika, Laboratory of Governance Prospects for Sustainable Local Development, International Conference on the Connection between Artificial Intelligence, Reality, and Law, p. 7.

[19] **Qaraza, Balqis, & Qasaa, Souad.** *Digital Bias in Artificial Intelligence Systems*. **Previously cited reference, p. 7.**

[20] Julia Dressel and Hany Farid (2018) 'The accuracy, fairness, and limits of predicting recidivism', *Science Advanced*, Vol 4, no.

Conclusion

Amid the accelerating technological revolution, artificial intelligence and smart robotics have become an inevitable reality, asserting their presence across various sectors, including the judiciary. This study has demonstrated that the use of smart robots in judicial systems represents a qualitative shift in the methods of judicial work, offering enhanced speed, accuracy, and efficiency in data processing and decision-making. However, this usage raises numerous legal and human rights concerns, particularly in the absence of clear legislative frameworks that regulate the operation of such systems, define their legal responsibilities, and maintain the delicate balance between the imperatives of justice and those of security.

Findings

1. Despite their advancement, smart robots still rely on algorithms designed by humans, making them susceptible to biases and programming errors. The use of these robots in judicial proceedings may threaten fundamental rights such as the right to privacy, individual freedom, and the guarantee of a fair trial.

2. Most Arab legal systems, including Jordan's, lack a clear legal framework regulating the use of AI and robotics in judicial procedures. Some developed countries (such as China and the United States) have already begun integrating AI into their courts, adopting both technical and legal safeguards to mitigate associated risks.

3. Artificial intelligence should remain a supportive tool for judges rather than a substitute, given its limited capacity to grasp emotional, ethical, and human considerations in disputes.

Recommendations

1. A dedicated national legislation must be enacted to regulate the use of smart robots in judicial enforcement and the broader justice system. Such legislation should include precise definitions, legal safeguards, usage limitations, and emphasize that the role of smart robots should be confined to auxiliary tasks—such as data analysis and pattern detection—without extending to making critical decisions that affect individual freedoms.

2. Specialized committees should be established to review the AI algorithms used in judicial processes, ensuring their neutrality and alignment with constitutional standards. These systems must incorporate human rights

principles and procedural justice into their design and development, particularly in the field of criminal justice.

3. Collaboration must be strengthened between legislators, technical experts, and judges to develop ethical and technical guidelines for the safe and disciplined use of AI within the judicial system.

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