

## Legal challenges caused by artificial intelligence and its applications in the public sector

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### Abstract

In recent years, artificial intelligence (AI) as one of the leading and powerful technologies in various fields has played an important role in social and economic developments. This technology is expanding rapidly not only in various industries but also in public sectors. In various fields such as healthcare, education, transportation, judiciary and public services, the use of artificial intelligence has led to an increase in the efficiency, speed and accuracy of services. The use of this new technology can greatly optimize public services, so that the processes are simpler, faster and with the least errors. At the same time, artificial intelligence can help improve the quality of life of citizens by providing innovative solutions in various fields, including medical data analysis, traffic prediction, and improving judicial decision-making processes. Despite these advantages, the rapid growth of artificial intelligence has also brought new legal and social challenges. Among these challenges is the issue of responsibility in case of errors caused by the operation of artificial intelligence; This means that if a system based on artificial intelligence makes a mistake or makes incorrect decisions, questions are raised about determining its legal responsibility. In addition, there are serious concerns about the protection of people's privacy due to the extensive collection and analysis of personal data by artificial intelligence systems. With the aim of analyzing and investigating these challenges, this article examines various applications of artificial intelligence in the public sector and pays special attention to its legal and social aspects. Also, in this study, an attempt has been made to provide appropriate legal solutions and regulatory frameworks to deal with these challenges. In addition, it examines the role of governments and legal institutions in regulating and controlling this technology, and how legal systems face the rapid advancements of artificial intelligence is analyzed.

**.Keywords:** Artificial intelligence, legal challenges, accountability, data protection, public sector

## 1-Introduction

Artificial intelligence is one of the most transformative technologies of the contemporary era, which has penetrated from simple applications such as image recognition to complex decisions in economic, social, and even judicial fields [1]. In the public sector, artificial intelligence promises to improve the quality and efficiency of services such as health, education, transportation and judicial justice [2,3]. However, the expansion of this technology is associated with important legal challenges, which neglecting them can have irreparable consequences for citizens and governments. One of the basic challenges in this field is the issue of responsibility and accountability in case of errors caused by artificial intelligence systems [4]. This issue is especially highlighted in applications whose decisions can have serious effects on people's lives, such as the judicial system and public health. Besides that, the issue of protecting personal data and privacy, which is often used by artificial intelligence systems for analysis and processing, is also an important legal challenge. Also, there are concerns about the unfair discrimination and bias of artificial intelligence systems that can lead to the violation of the rights of certain individuals and groups in society [5]. The purpose of this article is to comprehensively examine the legal challenges caused by artificial intelligence in the public sector and propose practical solutions to deal with these challenges. Next, we will examine the definition and history of artificial intelligence and then analyze the applications of this technology in the public sector and the legal challenges related to it.

## 2- Definition of artificial intelligence

Artificial Intelligence (AI) is an interdisciplinary branch of computer science, mathematics and psychology that deals with the study and development of systems and algorithms that are capable of simulating or imitating human intelligence. These systems can perform tasks that normally require thinking, understanding, and decision making[6]. These tasks include learning from data, recognizing patterns, solving complex problems, and even natural language processing (such as conversation or text analysis). Artificial intelligence generally works with the help of advanced algorithms and computational models and has the ability to learn from new experiences and data. This learning can be supervised (using labeled data), or unsupervised (finding patterns without labeling the data) [7,8]. Unlike traditional systems that are fully programmed by humans, AI systems can improve automatically by interacting with the environment and various data, and use the past to improve the future. This characteristic of learning and adaptability is the most important difference between intelligent systems and traditional computing systems[9].

### 2-1 types of artificial intelligence

Artificial intelligence can be divided into several different categories, each with different levels of complexity and capability. Broadly speaking, this category is divided into two main categories: weak AI and strong AI. Also, there are other divisions such as general artificial intelligence and limited artificial intelligence, each drawing different visions of the future of this technology[10,3].

#### 2-1-1 Weak Artificial Intelligence (Narrow AI)

Weak Artificial Intelligence, also known as limited AI, refers to systems that are designed to perform specific tasks and are capable of performing those tasks in a very efficient manner. This type of artificial intelligence operates within a specific range of tasks and cannot be used outside of that area [4]. For example, voice assistants such as Siri or Google Assistant are able to understand voice commands and provide appropriate responses, but they are not capable of solving other problems outside of their programmed domain. Facial recognition systems, Internet search engines, and content recommendation tools (such as movie recommendation systems on Netflix or products on Amazon) are also examples of weak AI [11]. These systems use machine learning algorithms and optimize their performance by processing a huge amount of data. However, such systems cannot think independently or be deployed in other tasks.

#### 2-1-2 Strong artificial intelligence (Strong AI)

Strong artificial intelligence refers to a system that has the ability to perform extensive tasks independently and with intelligence similar to or even beyond that of humans. These systems can not only learn, but are also able to understand and interpret information, think abstractly, and make decisions in complex and unexpected situations. One of the ultimate goals of strong artificial intelligence is to build a system that can think, feel and make decisions in new situations like a human [12,7]. These systems can have a deep understanding of their environment, analyze new information independently and make rational decisions. Such artificial intelligence is not yet fully realized, but many researchers and engineers are trying to get there. Due to its complexity and potential capabilities, strong artificial

intelligence has also become the subject of philosophical and ethical debates, as it raises important questions about consciousness, responsibility, and the ethical implications of using such systems [9].

### 3- History of artificial intelligence

The history of artificial intelligence dates back to the mid-twentieth century when researchers first sought to create machines that could think and act like humans. The initial idea of artificial intelligence originated from the work of Alan Turing, a British mathematician and philosopher. In the 1950s, he introduced the concept of "thinking machines" and proposed his famous test, known as the "Turing Test," to determine whether machines could imitate human intelligent behavior. The Turing Test addresses the question of whether a machine can become intelligent enough to convince a human that it is also human [5]. In 1956, John McCarthy and his colleagues introduced artificial intelligence as an independent scientific field at a conference in Dartmouth, coining the term "Artificial Intelligence" for the first time. This event marked a turning point in the history of computer science and initiated a path that continues to this day. In the following decades, artificial intelligence faced numerous challenges and successes. During the 1960s and 1970s, many early AI projects failed due to hardware and theoretical limitations [8]. However, research continued, and significant advancements were made. In the 1980s, the emergence of machine learning algorithms, and later in the 2010s with advancements in deep learning and artificial neural networks, ushered artificial intelligence into a new and accelerated development phase. Deep learning algorithms enable AI systems to process vast amounts of data and extract complex patterns from this data. These technologies have fundamentally transformed various fields, especially in image recognition, natural language processing, gaming, and even medicine [2,1]. For example, in healthcare, AI assists in diagnosing diseases, providing precise treatments, and analyzing clinical data. In transportation, self-driving cars represent one of the most significant applications of AI, garnering substantial attention. Overall, artificial intelligence has now become not only an intriguing research field but also a key technology in everyday life. This technology currently plays an important role in many industrial and scientific sectors, ranging from business and finance to healthcare, education, and even social and legal domains. Its significance is expected to grow even further in the future [4].

### 4- Applications of artificial intelligence in public sectors

#### 4-1 Artificial intelligence in the judicial system

One of the key areas in which artificial intelligence has entered is the judicial system. The use of artificial intelligence-based systems is used in this field from the automatic detection of crimes to the prediction of the probability of crime or its repetition. This technology can increase the speed and accuracy of decisions and help reduce the workload of judges and court staff [13]. However, there are also significant challenges in this field. One of the main concerns is impartiality and justice in judicial decisions. AI systems may make decisions based on historical data that may contain bias or discrimination. For example, if the input data to an AI system includes examples of past discriminatory behavior, the system may produce discriminatory results. In addition, the issue of transparency in the process of judicial decisions based on artificial intelligence is also very important. If a system makes a decision, citizens and lawyers should be able to understand how and on what basis the decision was made [5].

#### 4-2 Artificial intelligence in public health

Artificial intelligence has great potential in improving public health systems. Automatic disease diagnosis systems, management of medical records and optimization of hospital services are among the applications of this technology in the health sector. For example, AI algorithms can analyze medical images such as CT scans or MRIs and accurately detect early signs of diseases such as cancer [4]. However, these applications also come with significant legal challenges. One of these challenges is the issue of accountability in case of wrong diagnosis or incorrect decisions. If an AI system fails to correctly diagnose a disease and this leads to patient harm, the question is who should be held accountable: system developers, clinicians, or end users? Also, there are concerns about the privacy and security of patients' medical information. This information is often sensitive and must be protected from unauthorized disclosure or misuse [9].

#### 4-3 Artificial intelligence in education

The application of artificial intelligence in educational systems is increasing rapidly. These systems can help teachers and administrators in analyzing students' performance, identifying weaknesses and suggesting educational solutions. For example, AI-based educational platforms can design lesson content for each student in a personalized way to optimize the learning process. But this technology also faces challenges [14]. The first issue is fairness in access to

these technologies. Not all students and schools may have equal access to AI, which can widen the learning gap between students. Also, concerns related to the privacy of students and the collection of educational data are other challenges in this field. Educational data collected by artificial intelligence systems includes sensitive information about students' academic progress, learning behaviors, and even family circumstances that, if mismanaged, may lead to privacy violations [13,4].

#### 4-4 Artificial intelligence in public transportation

Artificial intelligence systems in public transportation can help improve traffic management, optimize routes, and reduce road accidents. For example, self-driving cars equipped with artificial intelligence technology can navigate the roads without the need for a human driver. Also, artificial intelligence can help in the intelligent management of urban traffic and prevent the occurrence of heavy traffic and environmental pollutants. But, these technologies also face many legal challenges [15]. One of the main challenges in this field is determining responsibility in the event of an accident with self-driving cars. If a self-driving car gets into an accident, is the car manufacturer, the owner, or the programmers of the AI system responsible? Also, issues related to cyber security in transportation systems based on artificial intelligence are also raised. Hacking a self-driving system or traffic management systems can have disastrous consequences [11,6].

### 5- Challenges of artificial intelligence

The set of diagrams in Figure 1 comprehensively analyzes the challenges and trends in the use of artificial intelligence in the health and public sectors:

1. The bar graph of AI challenges in healthcare points to four key challenges: data privacy, transparency in decision-making, impartiality and fairness, and legal liability. In this chart, legal liability is identified as the biggest challenge with 90% importance. This issue points to the complexity of determining responsibility in case of errors in AI-based decisions in health systems [16,2].
2. The circular diagram of the distribution of legal responsibility in artificial intelligence shows how responsibility for errors in artificial intelligence systems is divided between different actors. The largest share belongs to developers (35%) and shared responsibility (30%), which shows the complexity of this issue; Especially in situations where errors may be the result of interaction between several factors such as software design, user usage, and government policies [14,7].
3. The linear graph of the growth of the use of artificial intelligence in the public sector shows the upward trend of the use of this technology during the years 2018 to 2023. In this period, the rate of adoption of artificial intelligence has increased from 10% to 90%, which indicates the increasing desire of government institutions to use artificial intelligence to improve services, increase efficiency and improve the quality of public administration [12].
4. Artificial Intelligence Challenges in the Public Sector bar graph looks at similar challenges in the public sector; including discrimination, transparency, privacy, and legal issues. Legal challenges with 85% and transparency with 80% are the most important, which shows that in the public sector, transparency in decision-making processes and ensuring that people's legal rights are respected are among the most important concerns in the use of artificial intelligence [3,4]. These charts clearly show that although AI has great potential to improve efficiency in the public and health sectors, the legal and ethical challenges, especially in the areas of transparency and accountability, must be carefully considered before the technology can be used in a way Be fair and legal.



Chart1: Artificial intelligence challenges in the public sector

## 6- Legal challenges caused by artificial intelligence

One of the most important legal challenges caused by the use of artificial intelligence is the issue of determining responsibility in case of errors or mistakes in the decisions of these systems. For example, in the event of a medical diagnosis error or an accident caused by a self-driving car, the main question is who should take responsibility? Is the responsibility on the designers and creators of the algorithms or the users and operators of the system?

**6-1 From a legal perspective**, there are three main approaches to determining the liability of artificial intelligence [16,5,2]:

1. **Manufacturer Liability:** This approach suggests that the creators of AI software and hardware should be held accountable in the event of a malfunction. Similar to product liability laws, if an AI system fails, the manufacturer should be responsible.
2. **User Liability:** In this approach, the user or operator of the AI system will be held responsible, especially if they have misused the technology.
3. **Shared Liability:** This approach divides responsibility among users, manufacturers, and even the AI algorithms themselves. It seeks to determine the level of responsibility based on the specific circumstances of each case.

### 6.2 Data protection and privacy

Another big legal challenge in the use of artificial intelligence is the issue of personal data protection and privacy. Artificial intelligence systems require access to a large amount of personal data for better performance, which often includes sensitive information such as medical, financial, or even social behavior of people [17]. Data protection laws such as the General Data Protection Regulation (GDPR) in the European Union have imposed restrictions on the collection and processing of personal data. According to these rules, companies and government entities that use artificial intelligence must ensure that user data is properly protected and not used without express and informed consent. However, the widespread use of data in AI systems, especially in the public sector, raises concerns about how these rules can be effectively enforced against advanced AI technologies [14,3].



### 6-3 Neutrality and non-discrimination

Artificial intelligence can make decisions based on historical data and machine learning. These data may have patterns of discrimination or bias. For example, if an AI system is trained to hire based on past data, and that past data includes racial or gender discrimination, it is likely that these discriminations will be subconsciously reflected in the AI's decisions. One of the well-known examples in this field is crime and delinquency prediction systems that have been used in some countries [12]. These systems are trained on historical crime data and may be biased against certain individuals or groups in society. Such systems can lead to increased discrimination in law enforcement and violate people's civil rights. To avoid such problems, there is a need to establish rules and regulations that help ensure the impartiality of artificial intelligence systems and prevent discrimination in decision-making processes. Also, companies and government agencies should have ongoing evaluation processes to identify and mitigate potential biases in algorithms [1,5].

### 6-4 Transparency and explainability

AI decisions AI systems are very complex and sometimes their decisions are completely incomprehensible to users and even developers. This problem, known as the "black box" of artificial intelligence, makes it impossible to clearly explain the reasons for the decisions made by these systems. This lack of transparency in decision-making can undermine public trust in artificial intelligence systems and also hinder the accountability of public and private institutions[2,4]. Especially in the public sector, where transparency and accountability are fundamental principles, the explainability of AI decisions is very important. For example, if an artificial intelligence system makes a decision about rejecting or approving an application for a loan or public service, the applicant must be able to understand why and based on what criteria this decision was made. To solve this problem, many experts suggest that artificial intelligence systems should be designed in such a way that they are able to provide explanations about their decision-making process. Also, it is necessary to develop legal standards to ensure transparency in AI decision-making processes[14].

## 7- National and international legal and regulatory frameworks

Legal and regulatory frameworks related to artificial intelligence (AI) are one of the vital and evolving areas of national and international law. Due to the rapid growth of technology and the increasing use of artificial intelligence in various fields, it is necessary to set laws and regulations to ensure the responsible and ethical use of this technology. In the following, the legal and regulatory frameworks of artificial intelligence at the national and international level are examined in detail.

### 7.1 National frameworks

#### Leading countries in artificial intelligence regulation

Some countries, especially developed countries such as the United States, the European Union, China, and Japan, are leading the way in creating artificial intelligence legal and regulatory frameworks. These countries have taken different approaches to regulating AI, but the main goal of all of them is to strike a balance between innovation and protecting citizens' rights and national security [5].

#### 7-1-1 United States of America

In the United States, laws and regulations related to artificial intelligence have not yet been widely adopted, but the government and various institutions are developing frameworks for this area. Some of the most important efforts include the following: Policymaking National AI Strategy: Announced in 2019, this strategy provides a framework for the development and responsible use of artificial intelligence and addresses issues related to privacy rights, Data security and ethics in the use of AI [6,7]. Regulatory bodies such as the FTC and NIST: The Federal Trade Commission (FTC) and the National Institute of Standards and Technology (NIST) play a key role in developing standards and overseeing the responsible use of artificial intelligence [11].

#### 7-1-2 European Union

The European Union is known as one of the pioneers of artificial intelligence regulation. In 2021, the European Union proposed the "Artificial Intelligence Act" (AI Act), which includes a comprehensive and regulatory framework for the use of artificial intelligence in various fields. The proposal defines three risk levels for AI applications [13,12]:

- ✓ Unauthorized uses: This includes artificial intelligence systems with unacceptable risks, such as widespread government surveillance.
- ✓ High-risk applications: such as the use of artificial intelligence in health systems, recruitment, and personal data management.
- ✓ Low-risk uses: Includes tools used for recreational or everyday purposes.

The EU is also involved in the development of ethical frameworks for artificial intelligence, including the "Ethics for Trusted AI" guidelines, which emphasize human rights, democracy, and transparency.

### 7-1-3 China

China is one of the countries that is heavily focused on the development of artificial intelligence while applying strict regulatory frameworks. China's policies in this area generally focus on the use of artificial intelligence for state interests and national security. China has also introduced strict laws on data protection and the use of artificial intelligence for public surveillance[8,2].

## 2.7 International frameworks

### 7-2-1 United Nations

The United Nations is one of the key institutions in the discussion of international regulations for artificial intelligence. Organizations affiliated with the United Nations, notably UNESCO and the Economic and Social Commission for Asia and the Pacific (ESCAP), are working to develop global standards for the responsible and ethical use of artificial intelligence [7]. For example: In 2021, UNESCO presented an ethical framework for artificial intelligence, which aims to promote human rights, social justice, and sustainable development through the responsible use of artificial intelligence. Global Compact on Ethics in Artificial Intelligence: As a strategic document, this compact defines principles such as transparency, accountability, and privacy protection for artificial intelligence [12].

### 7-2-2 Group of Seven (G7) and Group of Twenty (G20)

G7 and G20 member countries have also made efforts to create legal and regulatory frameworks for artificial intelligence. The joint statements presented at these summits emphasize the importance of developing artificial intelligence in a way that is compatible with democratic values. For example, at the 2019 G7 summit, countries agreed that AI regulation should be based on the principles of transparency, security, and non-discrimination [14,15].

### 7-2-3 Organization for Economic Cooperation and Development (OECD)

The OECD was one of the first international organizations to publish the "Principles of Artificial Intelligence" in 2019. These principles include recommendations for policymakers and governments to ensure the safe and ethical use of artificial intelligence in the economy and society. The main principles of this document include: transparency and accountability, security and sustainability, innovation and responsible economic growth [17].

## 8- Suggestions for improving legal frameworks

- 1) Creating transparency and accountability standards: One of the main challenges in using artificial intelligence is the lack of transparency in the decision-making processes of these systems. To improve this situation, laws and regulations should define standards for transparency and explainability of AI decisions. This means that artificial intelligence systems should be designed in such a way that, if needed, they can clearly explain the logic of their decisions and the people responsible for these decisions are clear. This is especially important in areas such as the judicial system, health and public services.
- 2) Formation of independent regulatory bodies: To monitor the performance and comply with regulations related to artificial intelligence in the public sector, the formation of independent regulatory bodies can be effective. These institutions can assess and monitor artificial intelligence systems, perform periodic inspections and, if necessary, pursue violations or set new regulations. These institutions must have sufficient power to implement laws and handle citizen complaints regarding possible violations.
- 3) Creating multiple legal responsibility frameworks: Considering that AI systems are typically developed in a multilayered manner and used by several different entities, it is necessary to define multiple legal responsibility rules. For example, if an artificial intelligence system fails in the public health sector, responsibility can be shared among the developers, user entities, and end users. This collective accountability approach helps prevent abuse and neglect.

- 4) Protecting privacy and improving cyber security: Data collected by artificial intelligence systems should be fully protected and cyber security of these systems should be improved. Data protection laws should be updated and appropriate security procedures should be implemented to prevent unauthorized access and misuse of citizens' data. Also, applying heavy penalties for privacy violations or disclosure of personal information can help reduce these risks.
- 5) Educating and informing public users: Another effective way to improve the use of artificial intelligence in the public sector is to educate users and inform them about their rights. Citizens should be aware of how their personal data is used by artificial intelligence systems and know how they can defend their rights. Also, specialized training is necessary for the employees of government and public institutions that work with this technology so that they can use this technology more effectively.

## conclusion

Artificial intelligence, as a new technology, has great potential to improve the quality of public services and the efficiency of government institutions. This technology can bring positive effects in various fields such as healthcare, transportation, and urban management. However, these developments are accompanied by serious legal and ethical challenges. Privacy and data protection is one of the most important issues that can be compromised, especially in the collection and processing of citizens' personal data. Government institutions must establish strong and transparent mechanisms for managing and protecting personal information. Furthermore, algorithmic discrimination, which is caused by biases in the training data, can lead to unfair results. Therefore, criteria and standards should be established for the design and evaluation of algorithms in order to prevent injustices caused by the incorrect use of artificial intelligence. In addition, accountability and transparency in AI decision-making processes are also very important. Creating explainable systems capable of explaining decisions made by algorithms can help increase public trust. Also, it is necessary to create new legal frameworks to determine legal responsibilities for the mistakes of artificial intelligence systems. In this regard, government institutions and organizations should research and develop artificial intelligence technologies in a responsible and ethical manner and educate their employees in this field. These measures can lead to the realization of a favorable legal and ethical environment for the use of artificial intelligence in the public sector and help improve the quality of life of citizens. Finally, it should be noted that artificial intelligence should be used as a tool to serve humans and promote human values, and not as a means to violate individual rights or create social inequalities.

## Resources

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