

Artificial Intelligence and Its Role in Legal Dispute Resolution

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Introduction

Recently, the world has witnessed rapid technological advancements, most notably in artificial intelligence (AI). AI has become a vital component across various sectors, including the legal field, which for a long time relied solely on human effort to interpret legal texts, analyze facts, and resolve disputes. With the increasing complexity and volume of disputes, the need for more precise and efficient tools to expedite dispute resolution and reduce associated costs has emerged.

AI has contributed innovative technical solutions in predicting case outcomes, analyzing legal precedents, managing litigation files, and even participating in mediation and online arbitration procedures. Some judicial systems have adopted AI-based mechanisms to assist in decision-making or provide judicial recommendations.

Disputes—whether civil, commercial, or administrative—are among the areas where AI can offer effective solutions, particularly in pre-litigation stages, online dispute resolution (ODR), and facilitating processes within courts and arbitration institutions.

Despite the significant benefits expected from applying AI in dispute resolution, there are numerous legal and ethical challenges, such as the limits of legal liability, ensuring the impartiality of intelligent systems, protecting privacy, and the necessity of legislation to regulate these technological solutions.

This paper aims to examine the current state and prospects of AI applications in legal dispute resolution by reviewing theoretical frameworks, analyzing internationally adopted models, and discussing related legal frameworks, with a focus on procedural, ethical, and legislative aspects.

Significance of the Paper

The importance of this topic lies in the following points:

- Highlighting AI's role as a modern and effective tool in dispute resolution.
- Guiding Arab legislators toward regulating AI use in the judicial field.
- Assisting in understanding the nature of legal responsibility associated with decisions made by intelligent systems.
- Raising legal awareness of the ethical and technical challenges of AI applications.
- Serving as a reference for researchers and professionals in law and technology.

Objectives of the Paper: This study aims to achieve the following objectives:

- Clarify the legal and technical concepts of AI applications.
- Explore ways to utilize AI in resolving judicial and non-judicial disputes.
- Analyze the legal frameworks regulating these applications in some international models.
- Examine the legal and ethical challenges associated with using AI in dispute resolution.
- Propose recommendations for developing national legislation in line with AI applications.

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Reason for Choosing the Topic

The selection of this topic is due to several reasons, including:

- The widespread nature of disputes and increasing pressure on traditional judicial systems.
- The need for modern tools to accelerate litigation and dispute resolution processes.
- The lack of sufficient Arab legal studies addressing AI as a means of resolving disputes.
- The growing global trend toward automating judicial and arbitration services.
- The researcher's desire to contribute scientifically to a topic that bridges law and modern technology.

Problem Statement

The problem this paper seeks to address revolves around the lack of specialized legislation, as existing laws tend to be traditional. Additionally, applying AI to judicial and legal disputes presents challenges due to AI's continuous development. This paper focuses on the following points to discuss these concepts.

Methodology

This research adopts a descriptive-analytical methodology by analyzing relevant legal texts and judicial principles. It also employs a comparative approach to examine various international experiences in applying AI to dispute resolution, alongside a futuristic approach to anticipate the development and regulation of such applications.

Structure of the Research

The research comprises an introduction and three chapters as follows:

Chapter One: Definition of Artificial Intelligence

- Section One: The essence of artificial intelligence
- Section Two: Characteristics of artificial intelligence
- Section Three: The legal framework of artificial intelligence in Sudan

Chapter Two: Types of Legal Disputes and Traditional Resolution Methods

- Section One: Types of legal disputes
- Section Two: Judicial dispute resolution methods
- Section Three: Non-judicial dispute resolution methods

Chapter Three: Applications of AI in Dispute Resolution

- Section One: AI-supported online dispute resolution (ODR)
- Section Two: Electronic arbitration and intelligent systems in arbitration procedures
- Section Three: AI in judicial support: from analysis to prediction of judgments

Chapter One: Defining Artificial Intelligence

Technology is one of the most prominent features of the modern era, and artificial intelligence (AI) represents one of the most significant technological applications that have brought about transformative changes across various sectors, including the legal field. Understanding the concepts of AI, its characteristics, and its legal framework is crucial to assessing its applicability in dispute resolution. This chapter explores the conceptual and legislative framework of AI to provide a deeper understanding of its future role in the judicial system.

Section One: The Essence of Artificial Intelligence (AI)

AI is among the most notable outputs of the Fourth Industrial Revolution. It is one of the newest and most innovative scientific fields, primarily relying on programming, computing, and modern technology. AI serves as the cornerstone for enabling machines to emulate human behavior and has been widely adopted across various fields, such as medicine, engineering, industry, and commerce.

Definition of Artificial Intelligence

Despite the growing interest in AI across all fields and institutions, there is no universally accepted definition of it. Numerous definitions reflect the depth and breadth of this rapidly expanding field, which has seen significant growth in recent decades. AI is now a fundamental technology in many industries and scientific endeavors.

Alan Turing defined AI as the ability to behave in a manner indistinguishable from human behavior, by attempting to deceive the respondent into believing the responses were provided by a human.

Elaine Alice Rich, an American computer scientist, defined AI as “the study of making computers perform tasks that humans can perform in some way.”

Marvin Minsky, one of the pioneers of AI, described it as “the construction of computer programs capable of engaging in tasks performed by humans in a satisfactory manner, requiring high-level mental processes such as perception, learning, memory organization, and critical thinking.”

John McCarthy, another key figure in AI, defined it as “the science and engineering of making intelligent machines.”

The Origins of Artificial Intelligence

The development of AI is a fascinating journey marked by significant progress since its inception. The roots of AI date back to the mid-20th century, when Alan Turing laid the theoretical foundation for AI.

The period between the 1940s and 1950s marked the initial steps toward AI, with the emergence of neural networks. Neurologists Walter Pitts and Warren McCulloch developed the first mathematical model of biological neurons and artificial neurons, introducing the logical computation of basic concepts in neural activity.

In 1956, at a conference at Dartmouth College, American computer scientist John McCarthy coined the term “artificial intelligence” for the first time. This period marked the beginning of efforts to develop automated models capable of analyzing behavior in a simple manner, such as learning, though these initial models were unsuccessful.

In 1967, Marvin Minsky, one of the founders of the Massachusetts Institute of Technology (MIT), predicted that the problem of AI would largely be solved within a generation. However, due to the challenges AI faced and the ongoing pressure from Congress, the British and American governments reduced research funding, halting AI research progress.

By the early 1980s, AI research experienced a resurgence with the commercial success of expert systems, which simulate the knowledge and analytical skills of one or more human experts. By 1985, the AI market exceeded \$1 billion in revenue, prompting governments to play a significant role in funding AI research once again.

In the 1990s and early 2000s, AI achieved major breakthroughs, paving the way for its application in numerous fields.

Robotics, a prominent area of AI, focuses on mimicking motor functions performed by humans or animals. Robotics applications range from military uses, such as espionage and minefield clearance, to medical uses, such as diagnostics and treatment. For instance, in 2004, the “Da Vinci” robot was successfully employed for the first time at King Khalid University Hospital in Saudi Arabia to perform a rare pediatric gastric bypass surgery for a child suffering from obesity.

Section Two: Characteristics of Artificial Intelligence

Studies indicate that artificial intelligence (AI) possesses unique characteristics that distinguish it from other technologies. By emulating human intelligence, AI demonstrates several key traits, including the ability to learn, make decisions independently, and solve problems with precision and speed. Below are the most significant features of AI:

Learning Ability and Human Needs Awareness

AI systems monitor human behavior and track habitual activities, such as preferred news topics, favorite places to visit, or product advertisements that appear without prior searches. These outcomes result from modeling specific life domains and identifying relationships among elements to produce appropriate results.

AI's learning ability is based on input provided by humans, enabling the system to comprehend and make sense of data. While some argue that AI cannot possess true comprehension without prior human input, others believe that AI can think and innovate through learning and understanding.

AI's ability to learn from mistakes is a crucial marker of intelligent behavior, enabling it to improve performance through trial-and-error processes. The capacity for learning and adapting depends on technological advancements, meaning what is impossible today may become achievable in the future.

Independence and Decision-Making Capability

AI systems can operate autonomously at certain levels, utilizing prior human-fed information to function and draw conclusions. These systems can offer suggestions and respond to user requests, demonstrating their ability to reason logically, similar to humans.

For instance, AI systems can perform inference processes by matching sounds or objects, enabling logical reasoning. However, the reasoning and decision-making capabilities of AI are inherently tied to human intelligence. AI can only make conclusions based on pre-programmed information, and its successes are a testament to human innovation and supervision.

Even when AI surpasses human performance in certain fields, such as mathematical computations, it is crucial to acknowledge that such advancements stem from human intervention and programming. Humans remain the creators and programmers of these intelligent systems.

Section Three: Legal Framework of Artificial Intelligence in Sudan

AI has introduced groundbreaking changes across various sectors, necessitating a legal framework to regulate its use and applications. In Sudan, the legal framework for AI remains in its developmental stages, with some existing legislation applicable to this field.

National Legislation Governing AI

Communications Act of 2001

The Communications Act of 2001 regulates the telecommunications and information technology sectors in Sudan. While the Act does not explicitly reference AI, several provisions can be extended to cover AI applications:

Article 4 grants the National Communications Authority the power to regulate and develop telecommunications and information technology services, including AI technologies.

Article 7 requires telecommunications service providers to obtain necessary licenses, which may extend to AI service providers.

Cybercrime Act of 2007

The Cybercrime Act of 2007 aims to combat technology-related crimes, including those perpetrated through AI applications. Relevant provisions include:

- Article 3 criminalizes unauthorized access to electronic systems, which could include AI systems.
- Article 6 criminalizes data manipulation and tampering, which could relate to AI technologies.

Consumer Protection Act of 2012

The Consumer Protection Act of 2012 seeks to safeguard consumer rights, extending to AI-based products and services. Relevant provisions include:

- Article 5 obligates suppliers to provide accurate information about their products and services, including those based on AI.
- Article 8 affirms consumers' right to safe products, applicable to AI applications.

Second: Applications of Artificial Intelligence in Sudan

Academic Initiatives

Sudan has demonstrated increasing interest in artificial intelligence (AI) technologies. For instance, Port Sudan University has held meetings aimed at establishing a specialized AI faculty to meet labor market demands and develop local expertise in this field. This reflects a commitment to advancing education and research in AI.

Participation in Regional Events

Sudan has also shown a growing interest in the development and application of AI technologies. In February 2025, Sudan participated in the Arab Dialogue Circle on "Artificial Intelligence in the Arab World: Innovative Applications and Ethical Challenges," organized by the General Secretariat of the Arab League, in collaboration with the Arab Academy for Science, Technology, and Maritime Transport, and Naif Arab University for Security Sciences. Sudan's involvement in such initiatives highlights its dedication to keeping pace with advancements in this field.

Chapter Two: Types of Legal Disputes and Traditional Resolution Methods

Before exploring the role of AI in dispute resolution, it is essential to understand the nature of legal disputes and their various types, including civil, commercial, criminal, administrative, and international disputes. This chapter also reviews the traditional methods of dispute resolution, both judicial (through courts) and non-judicial (such as mediation and arbitration), to provide a foundational reference for assessing the effectiveness of modern technological alternatives.

Section One: Types of Legal Disputes

Legal disputes vary based on the relationships between individuals and institutions and can be broadly classified into civil, criminal, administrative, and commercial disputes. Legal disputes are disagreements between two or more parties concerning a right or legal obligation, adjudicated by a competent authority such as courts or arbitration bodies. The nature of such disputes depends on the source of the legal obligation, the complexity of the relationship, and the parties involved.

- **Civil Disputes:**
These involve disputes related to private individual rights, such as contracts of sale, leases, compensations, tort liabilities, and inheritance. Civil disputes are governed by civil law and resolved by civil courts per the provisions of such laws.
- **Criminal Disputes:**
These arise from actions deemed crimes under the law, such as murder, theft, or forgery. Criminal disputes aim not only to restore rights but also to enforce punitive measures for public interest. Such cases are governed by criminal law and heard in criminal courts.
- **Administrative Disputes:**
These involve conflicts between individuals or institutions and public administration or governmental bodies, often concerning administrative decisions or abuse of authority.

Such disputes are typically handled by administrative courts.

- **Commercial Disputes:**
These disputes occur between merchants or commercial entities over transactions such as supply contracts, partnerships, or bankruptcy. Resolution often falls under commercial law, with parties frequently resorting to commercial arbitration.

Section Two: Judicial Dispute Resolution Methods

Judicial methods remain the traditional and primary means of resolving legal disputes, carried out by specialized judges under established legal procedures. These methods are categorized into:

Ordinary Courts:

This includes civil and criminal courts handling disputes between individuals or institutions according to jurisdiction. Judicial procedures typically involve filing lawsuits, litigation, judgment issuance, and appeals. Article 123 of the 2005 Transitional Constitution of Sudan states:

“The judiciary shall be independent and responsible for applying the law without interference from any authority.”

Administrative Courts:

Administrative courts handle disputes involving governmental bodies, aiming to protect individuals from administrative abuses. Many Arab nations have established specialized administrative courts to ensure procedural fairness.

Constitutional Courts:

These courts address the constitutionality of laws, disputes concerning constitutional interpretation, and conflicts between branches of government. They are vital for the legal protection of the constitutional system in the state.

Fourth: Commercial Disputes

Commercial disputes arise between merchants or commercial entities due to business transactions such as supply contracts, partnerships, or bankruptcy. These disputes are adjudicated under commercial law, and parties often resort to commercial arbitration for resolution.

Section Two: Judicial Dispute Resolution Methods

Judicial methods are among the traditional and essential means of settling legal disputes. These are presided over by specialized judges and follow procedures established by law. Judicial dispute resolution is divided into two main types: ordinary courts and specialized courts.

Ordinary Courts

Ordinary courts include civil and criminal courts, which hear disputes between individuals or institutions based on jurisdiction. The judicial process involves several stages: filing the lawsuit, litigation, judgment issuance, and appeal.

The 2005 Transitional Constitution of the Republic of Sudan enshrines judicial independence, stating in Article 123:

“The judiciary shall be independent and responsible for applying the law without interference from any authority.”

Administrative Courts

Administrative courts handle disputes involving one party as a governmental authority, aiming to protect individuals from administrative abuses. Most Arab countries have established specialized administrative courts to ensure procedural fairness in administrative actions.

Constitutional Courts

Constitutional courts specialize in adjudicating matters related to the constitutionality of laws, disputes over constitutional interpretation, and conflicts between governmental branches. They serve as a critical legal safeguard for the constitutional framework of a state.

Section Three: Non-Judicial Dispute Resolution Methods

Due to the volume and complexity of cases, alternative dispute resolution (ADR) methods have become increasingly important. These methods, including arbitration, mediation, and conciliation, offer flexible and swift mechanisms for resolving disputes.

Arbitration

- Arbitration allows disputing parties to refer their case to an arbitration panel instead of the courts, based on mutual agreement. The Sudanese Arbitration Act of 2005 governs this method.
- Arbitration is defined in legal doctrine as a system allowing disputes to be resolved by private individuals rather than state courts.

According to Sudanese legislation, arbitration is:

“An agreement between the parties to a civil dispute to refer their disputes, whether existing or future, related to the execution of a specific contract or any existing dispute, to individuals or bodies chosen by mutual consent.”

The Egyptian legislator defines arbitration as:

“An agreement between the parties to resort to arbitration to settle all or part of the disputes that have arisen or may arise between them in relation to a specific legal relationship, whether contractual or non-contractual.”

The Omani legislator states:

“An arbitration agreement is an agreement in which the parties to the dispute agree to refer all or some of the disputes that arise between them in relation to a specific legal relationship, whether contractual or not, to arbitration.”

According to French law:

“An arbitration clause is an agreement whereby the contracting parties agree to refer the obligations arising from the contract to arbitration.”

Arbitration is a form of private justice regulated by law, enabling certain disputes to be removed from general judicial oversight and resolved by private individuals chosen by the parties involved.

Mediation

Mediation involves a neutral third party (the mediator) facilitating negotiation between disputing parties to help them reach an amicable settlement without imposing a solution. This method was codified in the U.S. Alternative Dispute Resolution Act (ADR Act) of 1998 and has gained traction in Arab countries.

Conciliation

Conciliation is similar to mediation but involves the conciliator actively proposing objective solutions without imposing them. It is widely used in labor and commercial disputes and has been recognized in international frameworks such as the International Labour Organization's Convention No. 154 on Collective Bargaining (1981).

Chapter Three: Applications of Artificial Intelligence in Dispute Resolution

Amid rapid technological advancements, artificial intelligence (AI) has emerged as an effective tool for resolving legal disputes through innovative approaches that transcend traditional methods. This chapter explores the practical applications of AI in online dispute resolution, electronic arbitration, and judicial support, while analyzing the accompanying legal and ethical challenges and the extent of acceptance at national and international levels.

Section One: Online Dispute Resolution (ODR) Powered by Artificial Intelligence

Concept of Online Dispute Resolution (ODR):

ODR refers to a system designed to resolve disputes using online tools and technologies as an alternative to traditional judicial procedures. Initially developed for commercial disputes, particularly in e-commerce, ODR has since expanded to cover other types of disputes, such as family, labor, and civil disputes. AI has facilitated automation of certain resolution stages, including data analysis, suggesting solutions, and guiding parties toward the most suitable resolution methods without direct human intervention.

AI Applications in ODR:

AI plays an integral role in enhancing ODR platforms through technologies such as machine learning algorithms, which analyze dispute data and recommend solutions based on similar precedents. Platforms like Modria in the United States have employed this technology to resolve millions of consumer and service-related disputes. Similarly, countries like Canada and the Netherlands have developed AI-supported ODR systems to reduce court burdens and provide efficient alternatives for citizens.

Legal Challenges Associated with AI in ODR:

Despite its advantages in expediting resolution processes, AI's use in ODR raises legal concerns about the legitimacy of decisions issued by these platforms and their binding nature. Additional issues include data protection, algorithmic neutrality, and fairness. Judicial bodies have called for specific legislation to regulate ODR and ensure its compliance with national and international legal standards, thereby safeguarding procedural justice and the rights of involved parties.

Section Two: Electronic Arbitration and the Use of Intelligent Systems in Arbitration Procedures

Electronic Arbitration: Concept and Evolution

Electronic arbitration is the process of resolving disputes through an arbitral body chosen by the parties, utilizing electronic means at all stages, from submitting claims to issuing awards. This approach is particularly effective for cross-border commercial disputes, offering flexibility, efficiency, and cost reduction. With the development of AI, tools for data analysis and decision recommendations have been integrated into certain stages of electronic arbitration, enhancing the effectiveness of the process.

AI's Role in Supporting Arbitrators

AI assists arbitrators by analyzing thousands of relevant documents, identifying key legal points, and extracting patterns from arbitration precedents. Additionally, it can propose compromises based on the analysis of similar data, thereby reducing the time required to examine cases. For instance, ArbiLex is an emerging platform utilizing AI to support international arbitration.

Legal Recognition of AI-Based Arbitration Awards

The recognition of arbitration awards issued through AI platforms raises questions about their international acceptance and compliance with the 1958 New York Convention on the Recognition and Enforcement of Foreign Arbitral Awards. Article V of the Convention allows for refusal of enforcement if the award violates principles of fairness or due process. Consequently, AI systems used in arbitration must be subject to clear human oversight to ensure impartiality and adherence to procedural safeguards.

Section Three: AI in Supporting Judiciary – From Analysis to Predicting Judgments

Utilizing AI in Case Analysis

Several judicial systems, including those in France, China, and Canada, have adopted AI-driven programs to analyze legal cases. These programs sort documents, identify legal trends, and assess the likelihood of success in a case. One prominent example is ROSS Intelligence, a legal AI tool built on IBM's Watson technology, which helps understand and analyze complex legal questions.

Predicting Judicial Decisions Using AI

AI has evolved to the stage where it can predict judgments by analyzing vast amounts of case precedents and court data. Programs like Predictice in France and Lex Machina in the United States exemplify this capability, achieving prediction accuracy exceeding 70% for certain types of cases. Such tools prove valuable for lawyers and judges in evaluating a case's trajectory before filing or ruling on it.

Ethical and Legal Framework for AI in Judiciary

The application of AI in the judiciary faces challenges related to transparency, the right to defense, and oversight of algorithms. These concerns necessitate clear legislation ensuring that these tools remain under judicial human oversight. The European Commission's General Data Protection Regulation (GDPR) underscores individuals' rights not to be subjected to solely automated decisions affecting their rights (Article 22), which extends to judicial or arbitral decisions based on AI.

Conclusion

We praise Allah, by whose grace good deeds are completed, for granting us success in addressing "AI Applications in Dispute Resolution." It is evident that AI represents a transformative shift in resolving legal disputes, expanding its role beyond technical assistance to active interaction with judicial and arbitral procedures. While this technology offers significant advantages, such as speed, accuracy, and cost reduction, it simultaneously presents legal challenges related to privacy, transparency, and accountability. Consequently, establishing a robust legislative and ethical framework for these applications is imperative to keeping pace with technological advancements and ensuring justice.

Findings and Recommendations

Findings

- The study revealed that legal disputes are diverse in nature and require varied approaches, making AI suitable for certain types of disputes more than others.
- Online Dispute Resolution (ODR) is among the most mature applications of AI in legal contexts and is already in use in several countries.
- AI in electronic arbitration has expedited processes but still lacks universally binding legal frameworks.
- Judicial support through AI remains a subject of legal and ethical debate, despite its effectiveness in case analysis and judgment prediction.
- Some countries, including Sudan, still lack clear legislation regulating the use of AI in judiciary and arbitration systems.

Section Two: Recommendations

- **Legislative Framework:**
Enact national laws regulating the use of AI in dispute resolution to ensure the protection of rights and procedural integrity.
- **Capacity Building:**
Raise awareness among judges and lawyers about AI applications to enhance their efficiency and align with the digital transformation in the legal sector.
- **Ethical Standards:**
Integrate ethical guidelines into the design and implementation of AI judicial systems to ensure transparency, impartiality, and fairness.
- **AI-Supported Platforms:**
Establish national platforms for mediation and electronic arbitration powered by AI to alleviate court burdens and provide efficient alternatives for dispute resolution.
- **International Cooperation:**
Promote international collaboration to standardize legal frameworks governing AI in judicial systems, ensuring mutual recognition and enforcement of AI-assisted rulings across borders.

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