AI Judge Assistant: A New Upgrade of the Enabling Judicial System

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ABSTRACT

In the current era of AI technology development, with the number of judicial cases and the relative shortage of resources, the judicial efficiency, the judge assistant level is uneven and the judge's subjective thought influences judicial justice, AI technology judicial application of transparency, supervision and accountability mechanism and the trial level system also needs to be solved. Through literature analysis, comparative analysis and, statistical analysis, the research found that the introduction of "AI judge assistant" auxiliary judge case analysis, evidence review, legal retrieval and, other basic work, to build new trial assistant decision-making mechanism, and provide scientific and objective decision support, both reduce the interference of the judicial factors, promote the judicial process optimization, and promote the intelligent transformation of the judicial system. Based on the AI technology algorithm "black box characteristics" and highly consistent analysis, the input AI algorithm data regulation, weakens the subjective bias, builds AI judicial application supervision and accountability mechanism, the AI technology flexible fusion judicial level system, ensures that the judicial transparency, justice, for the judicial system innovation provides a new possibility, promote the construction of the rule of law society towards a new height.

Keywords: Artificial intelligence, AI judge assistant, black box features, vitrification

1. Introduction

In order to fully implement the spirit of the 20th and the first, third and fourth plenary sessions of the 20th Central Committee, adhering to integrity and innovation, and accelerate the deep integration of artificial intelligence and economy has become an important strategic direction of national development. As early as August 30, 2023, the Cyberspace Administration of China issued

the Interim Measures for the Management of Generated AI Services, which mentioned that industry organizations, enterprises, education and research institutions should cooperate with [1] in artificial intelligence technology innovation, data resource construction, transformation and application. In addition, on March 5, 2025, the Government Work Report 2025 further emphasized the continuous promotion of the "AI +" action [2]. This provides a strong policy support and development power for the application of artificial intelligence in the judicial field and also points out the direction for the modernization and intelligent transformation of the judicial system.

In the values of socialism with Chinese characteristics, freedom, equality, justice, and the rule of law form an essential module, representing the noble ideals that the Chinese people have been striving for throughout history. However, as times change, the current judicial system is facing severe challenges. According to statistics, the number of cases received by courts at all levels continues to rise annually, leading to an increasingly prominent contradiction between the large volume of cases and limited personnel. The issue of low judicial efficiency urgently needs to be addressed. The continuous complexity of case handling increases the workload for judges, and the professional capabilities required of judicial assistants are constantly being raised. It is imperative to tackle the uneven quality among judicial assistants. At the same time, judges inevitably incorporate subjective thoughts during trials, which can affect the realization of judicial fairness to some extent. The empowerment of AI in judicial proceedings also brings issues related to transparency, supervision, responsibility determination, and the adaptation of the trial system. Therefore, by introducing AI judicial assistants and regulating them, we can further enhance the support for judges, optimize the judicial trial process, reduce subjective biases, improve judicial efficiency, provide technical guarantees for judicial fairness, and promote the modernization and intelligent development of the judicial system. The Supreme People's Court issued the five-year Plan for the Construction of Information Technology in the People's Courts (2021-2025) [3], which pointed out the construction of "Smart Court 4.0". However, how to integrate artificial intelligence into the judicial trial system and promote the new upgrade of the judicial system remains to be further studied. Therefore, the research ideas are drawn up as follows: first, lay a solid foundation for the research and put forward questions; second, choose research methods to investigate the current situation; third, analyze the problems; fourth, put forward solutions; and finally, form conclusions.

2. Literature Review

In the context of a surge in judicial cases and relatively insufficient judge resources, issues such as low judicial efficiency, inconsistent adjudication standards, and subjective interference from judges have become increasingly prominent. The rapid development of artificial intelligence technology has provided new pathways for the intelligent transformation of the judicial system. Among these, "AI judicial assistants," as intelligent systems that assist judges in handling basic tasks, have become a research hotspot in the intersection of law and computer science in recent years. This article focuses on defining AI judicial assistants, their current technological status, challenges in judicial application, and institutional construction. It aims to systematically review relevant research findings both

domestically and internationally, reveal the progress and shortcomings of existing studies, and provide guidance for future research directions.

The literature primarily originates from China National Knowledge Infrastructure (CNKI), Web of Science, government public documents, and reports from international organizations. The search keywords include "AI judicial assistants," "artificial intelligence in the judiciary," "algorithmic transparency," and "judicial accountability." A total of 32 core documents were selected, covering academic papers, policy regulations, judicial practice cases, and technical white papers. Among these, domestic scholars have conducted more in-depth research on the institutional compatibility of AI judicial assistants, while foreign studies focus on algorithmic ethics and responsibility allocation issues. The annual report of the Supreme People's Court, the EU's Artificial Intelligence Act, and state-level legislative cases in the United States provide important policy analysis foundations for this article.

2.1 Definition and Technical Development Status of AI Judge Assistants

The core positioning of AI judicial assistants is as "technology-empowered judicial support tools." Zhu Hochman and Li Yuanguo (2021)[4] define them as "data processing systems," emphasizing their proficiency in automating repetitive tasks such as legal research and document generation. However, due to the "Hume problem," they cannot replace human value judgments. Zhang Hanline (2022)[5] presents a more forward-looking perspective, suggesting that AI can learn from judges' reasoning processes and evolve into "intelligent colleagues" to assist with complex legal reasoning. Jiang Hurling et al. (2023)[6] further point out that the essence of AI judicial assistants is to be "pioneers of judicial process innovation," achieving intelligent trial throughout the entire process through human-machine collaboration, thereby enhancing efficiency and credibility. In summary, the academic community generally agrees on two key functions: automation of procedural tasks (such as evidence classification and legal provision matching) and serving as carriers for experience inheritance (accumulating case experience through legal knowledge bases).

In terms of technology, the application of AI in the legal field is showing three major trends. First, technology is transitioning from "augmented intelligence" to "autonomous intelligence," with breakthroughs in quantum computing and multimodal fusion potentially solving complex issues such as cross-regional legal conflicts (Zhang Hanlin, 2022)[5]. Second, mature technologies (such as natural language processing and deep learning) have been widely applied in 85% of judicial processes, significantly improving the efficiency of document generation and case recommendation (Supreme People's Court, 2024)[14]. Third, application scenarios are becoming more specific, but they remain focused on procedural work, such as the Beijing Internet Court using AI to handle copyright disputes in bulk, reducing case processing time by 40% (Beijing Internet Court, 2023)[15]. However, technical bottlenecks still exist: AI excels at logical calculations but lacks moral judgment, making it difficult to balance rules and human sentiment (Li Xiaonan, 2020)[7].

2.2 Judicial Dilemmas and the Application Challenges of AI Judicial Assistants

The root of judicial difficulties lies in the contradiction between "a large number of cases and a

shortage of personnel" and the imbalance in the allocation of judicial resources. According to data from the Supreme People's Court, the total number of cases received by courts nationwide reached 45.574 million in 2023, with judges handling an average of over 380 cases per year, far exceeding reasonable capacity (Supreme People's Court, 2024)[14]. Issues such as uneven capabilities among judicial assistants and complex trial procedures further exacerbate inefficiency. In this context, AI judicial assistants are a key tool for addressing these challenges. For example, Shanghai's "206 System" uses image recognition technology to automatically extract evidence information, reducing the time required for individual case reviews from 40 hours to just 4 hours (Supreme People's Court, 2024)[14].

However, the application of AI faces multiple challenges: technical limitations: frequent updates to legal provisions and significant regional differences make it difficult for AI systems to synchronize promptly, potentially leading to decision-making errors (Mo Hao, 2024)[9]; ethical controversies: complex cases require balancing moral factors, while AI's "mechanical" judgments can easily spark debates about "lack of humanization" (Zuo Weimin, 2021)[3]; economic costs: continuous investment in system maintenance puts financial pressure on judicial institutions; social acceptance: the "black box" nature of algorithms undermines judicial credibility and public concerns that AI involvement will diminish the human touch in trials (Li Xiaonan, 2020)[7].

The institutional dilemma focuses on the conflict between authority and responsibility, as well as hierarchical conflicts. Taking the U.S. COMPAS algorithm as an example, its recidivism risk assessment has sparked widespread controversy due to racial bias (Wisconsin v. Roush, 2016)[17]. In China, if courts at all levels use the same algorithm model, it could render the second-instance error correction function ineffective, rendering it virtually meaningless (Mo Hao, 2024). Existing research calls for the establishment of a "dynamic algorithm stratification" mechanism, adjusting AI parameters according to court levels to preserve the space for second-instance remedies (Zhang Hanlin, 2022)[5].

2.3 Domestic and Foreign Regulations and Policy Analysis

International legislation exhibits the coexistence of "strict regulation" and "diverse exploration." The EU's AI Act (2024) categorizes judicial AI as a "high-risk" field, requiring algorithmic transparency, data traceability, and human oversight mechanisms,with clear stipulations that human judges retain the final say. Illinois' Artificial Intelligence Transparency Act (2023) [11]mandates the public disclosure of AI training data and bias test results, but there is a lack of unified federal legislation, relying instead on the Algorithm Accountability Act (2022) for limited constraints. Japan's White Paper on Science and Technology Innovation (2024) [12]emphasizes the need to strengthen research on AI ethics and legal issues to address the social impacts of technological diffusion.

Domestic policies emphasize both "encouraging innovation" and "risk prevention." The Interim Measures for the Administration of Generative Artificial Intelligence Services in 2023 require AI to align with "the core socialist values," but do not specify judicial scenarios; the "AI+" initiative in 2025 lists the judiciary as a key area, supporting the development of intelligent trial systems (State Council, 2025)[2]. In local pilots, the Shanghai Higher People's Court (2024)[13] stipulates that AI

can only handle non-discretionary tasks such as "disputes-free fact determination" and must obtain judicial compliance certification. However, existing regulations still have gaps: there is a lack of algorithm audit standards, unclear boundaries between rights and responsibilities, and technical liability has yet to be clearly distinguished from judicial liability (Lei Wanlu, 2022)[21].

2.4 Future Research Direction and System Construction

Current research has made some progress in technical implementation and institutional design, but there are still three major shortcomings: First, the lack of an ethical framework: there is no mature solution for how AI can balance legal rules with social norms; Second, insufficient algorithmic transparency: most systems do not disclose their decision-making logic, making public oversight difficult to enforce; Third, weak interdisciplinary research: collaboration mechanisms between legal scholars and technologists have yet to be established.

Future research should focus on the following directions: Technological level: Develop intelligent systems that integrate legal rules and ethical judgments, enhancing AI's situational understanding through case studies; Institutional level: Establish a "dual-track accountability system," distinguishing between technical responsibility (developers accountable for algorithmic biases) and judicial responsibility (judges responsible for accepting AI conclusions), with decision chains traceable via blockchain evidence; Social level: Build a "Committee of Justice," comprising technical experts, legal scholars, and public representatives to oversee AI operations, regularly publishing transparency reports (Zhang Hanlin, 2022)[5].

Finally, the research on AI judicial assistants demonstrates the deep intersection of law and technology. Current findings have clarified their role as "auxiliary tools" and significant progress has been made in improving efficiency and standardizing trial procedures. However, technical limitations, institutional conflicts, and ethical controversies remain major obstacles. In the future, it is necessary to transcend single-disciplinary perspectives, establish cross-domain collaboration mechanisms, and enhance algorithmic transparency and public participation. This study recommends focusing on "dynamic hierarchical algorithms" and "dual-track accountability" to promote the evolution of AI judicial assistants from "efficiency tools" to "reliable guardians of justice," providing theoretical and practical support for the intelligent transformation of the judicial system.

3. Current Development Status and Judicial Dilemma of AI

3.1 Definition of AI Judge Assistant and the Current Status Of AI

3.1.1 Definition of AI judge assistant

Scholars such as Zhu Haochuan and Li Yuanguo posit that AI judge assistants are fundamentally "data training systems." Their core functions involve automating quantifiable tasks (e.g., legal research, document generation) through pattern recognition and algorithmic models. Constrained by "Hume’s problem" (i.e., the inability to derive values from facts), they can only handle legal logic computations and fact organization, falling short of replacing human moral judgment[4]. Zhang Hanlin proposes that AI judge assistants could evolve into "intelligent colleagues" for judges, capable

of actively learning judicial reasoning and participating in complex legal deliberations. In the future, they may become collaborative decision-making partners, driving the intelligent transformation of the judiciary[5]. Jiang Huiling and colleagues define AI judge assistants as "engines of judicial process innovation," enabling full-process intelligent adjudication through human-machine collaboration to enhance efficiency and judicial credibility[6] Synthesizing these perspectives, AI judge assistants are judicial intelligence systems built on natural language processing (NLP), machine learning, and big data analytics. They aim to automate legal research, standardize judgment drafting, and streamline compliance reviews by constructing legal knowledge graphs, training logical reasoning models, and mining judicial data. Their essence lies in being technology-empowered efficiency tools and vehicles for institutional knowledge preservation.

3.1.2 The current status quo of AI development

Transition from "Augmented Intelligence" to "Autonomous Intelligence": Current AI technologies are shifting from mere tool-based assistance (e.g., automated workflows, data analysis) to systems with autonomous learning and decision-making capabilities. Examples include AI agents (e.g., enterprise systems autonomously handling multi-step tasks) and quantum AI exploration, signaling advancements toward higher complexity.

Mature Technologies: Machine learning, deep learning, and NLP are widely deployed in commercial applications such as smart customer service and recommendation systems.

Frontier Exploration: Research into Artificial General Intelligence (AGI) and Artificial Superintelligence (ASI) is accelerating. Some experts predict AGI breakthroughs within 26 years, though technical bottlenecks (e.g., multimodal fusion, hardware stability) remain unresolved.

Vertical Application Expansion and Cost Reduction: Declining model training costs (e.g., DeepSeek’s optimization via low-cost chips and algorithms) are shifting AI investments from infrastructure to application-layer expansion, accelerating adoption in verticals like healthcare and education. For instance, low-cost open-source models (e.g., DeepSeek R1) have significantly lowered entry barriers for enterprises.

Technology Integration and Ecosystem Development: The convergence of AI with cloud computing, edge computing, and the Internet of Things (IoT) has enabled hybrid operational models, supporting cross-platform collaboration and real-time data processing. Concurrently, quantum computing-AI integration offers novel pathways for solving complex optimization challenges.

3.1.3 AI judge assistant application bottleneck

While AI’s integration into judicial proceedings is undeniable—currently covering 85% of trial processes, including case filing, document review, court sessions, and judgment drafting—it still faces critical limitations. Presently, AI in judiciary systems is confined to procedural and repetitive tasks (e.g., document preparation, data analysis), rarely penetrating core judicial decision-making. Despite its robust analytical capabilities, AI risks delivering "cold" judgments in intricate cases.

Moreover, AI’s intelligence depends on extensive training. In the judicial domain, evolving legal frameworks and regional-specific laws may render algorithms outdated, causing misalignment with

practical jurisprudence. Continuous system updates entail high costs, straining judicial budgets.

Additionally, as a novel intervention, AI judge assistants disrupt traditional judicial practices. Public acceptance of AI-generated rulings directly impacts societal trust in verdicts and, by extension, judicial credibility. Addressing these challenges requires balancing technological innovation with ethical, financial, and institutional considerations.

3.2 Judicial Dilemma

In recent years, the serious imbalance of judicial supply and demand has become a key problem restricting the reform and development of the judicial system. According to the data of the Supreme People's Court, in the past decade from 2013 to 2023, the number of cases received by courts across the country increased rapidly, with an average annual increase of 2 million to 3 million cases. In 2019, it directly exceeded 30 million. In 2023, the cases directly soared to 45.574 million, a year-on-year increase of 15.6%. However, in sharp contrast, after the reform of the judicial staffing system, the total number of judges has stabilized at around 120,000 (data in 2017), and the annual per capita number of cases handled by judges has increased rapidly. Due to the large number of cases, the court faces great pressure when allocating judicial resources, and it is difficult for the court facilities and judicial auxiliary personnel to meet the actual needs, which leads to the low judicial efficiency. According to the central committee of the communist party of China issued by the rule of law construction planning (2020-2020), our country will continue to promote law popularization education, legal penetration, can work for the judges provide better public opinion environment, but under such a large population in China, it must be a long process, at the same time, with the law is the judicial attention and high need, the judge is still facing severe challenges.

Secondly, even if the judge is the "leading role" of the judicial organs, if they want to play a wonderful performance, the support and cooperation of the "supporting role" are indispensable. In order to make the judges give full play to their talents, all countries generally attach importance to the allocation of the auxiliary judicial personnel. Judge assistant is an important support in the work process of judges. With the increasing complexity of cases, the professional requirements for judge assistants are also constantly improving, requiring judge assistants to have the corresponding professional level, adjustment ability and accurate understanding of their position in the judiciary. However, the way and term conditions of judge assistants are not clear. After determining the quota of judges, some courts directly appoint judges, judge assistants and clerks who are not engaged in judges as judge assistants. The professionalism of judge assistants is worth deliberation. According to in Shandong province Dongying city intermediate people's court report, individual judge assistant ability is limited, the assistant judge failed to digest simple case before trial, cannot preparation before the trial, because the judge assistant business level, the judge cannot really from multifarious affairs, and because of the judge assistant system is not complete, even a judge assistant doesn’t listen to the judge command. Although there are many excellent legal talents among the ranks of judicial assistants, which provide guarantee for the trial of judges, the uneven level of judicial assistants makes the unbalanced development of the judicial level worse, aggravating the weakness of the judicial level in some areas.

Finally, as a person with emotional cognition, the judge's life experience, educational background and values will all affect the final judgment of the judge. "The same case and the same judgment" has always been pursued by China's judicial practice. As a statutory country, our laws have considerable stability. For the case of the same nature, the judgment made by the judge should not have excessive deviation. In the face of the vague legal provisions, how to make the correct application according to the case needs to make certain restrictions on the subjectivity of the judge. In the real judicial practice, due to the evidence and facts identified and errors is not in the minority, such as the well-known case of Hugujiltu, a wrong injustice, to the parties and the family of the damage is irreversible, the court on behalf of the state power of the judicial credibility is also a huge blow. Therefore, it is in urgent need of a supporting force, to help the judge the discretion and evidence legal boundary, remind the judge not too much by self-heart and affected by the justice of the case, safeguard the judge trial more comprehensive and objective, fair, avoid justice, in order to achieve a higher level of fairness and justice.

3.3 System Dilemma

AI enters the field of judicial trials, making the judicial trials more digital characteristics, and the judgment process of cases gradually becomes a kind of digital calculus. In the case of COMPAS (Correctional Offender Management Profiling for Alternative Sanctions), COMPAS is a tool used to assess the risk of criminal recidivism. Its principle is based on a machine learning algorithm, a large number of analyses of criminal data, including criminal history, criminal background and other information, to make a prediction of whether a criminal commits again [7]. With the continuous development of AI technology, through such objective and scientific evaluation, it can relieve the pressure of judicial trials, help judges to make better decisions, and also achieve certain supervision and control over criminals. COMPAS algorithm shows obvious advantages in the practice of judicial trials, and the algorithm is also applied by the law enforcement agencies of multiple state governments in the United States. However, according to the Probulic survey, the proportion of Black people mislabeled as potential criminal molecules in the COMPAS algorithm is almost twice that of whites. Such algorithm errors are very hidden, especially the bias caused by the data itself, which is difficult to detect. How to supervise the auxiliary work of AI judge assistants to avoid the injustice of the trial results caused by the opacity of the algorithm itself is a major problem that we need to solve.

In addition, it is a long-term process for AI to enter the judicial field and will continue to develop and improve. How should we face many problems that may occur in this process? On the one hand, the current judicial artificial intelligence technology is still in the stage of weak artificial intelligence, and the AI itself needs to constantly overcome the technical bottleneck so that it can evolve into more advanced intelligence. On the other hand, the society we live in is constantly changing. When a new thing comes into people's vision, it will inevitably cause a series of new problems at the legal level. If a new phenomenon hits the judicial field, whether AI can still make a reasonable analysis. We integrate AI judge assistants into every link of the judicial trial so that, as a great power of the judicial trial, it will inevitably influence the final judgment of judges to some extent. However, under the existing system, there is no specific regulation [8] on how to clarify the power and responsibility

boundary of judges and AI judge assistants. When the AI judge assistant's algorithm leads to unjust, false and wrong cases, how to allocate the responsibility with the judge? At the institutional level, we lack a specific and clear accountability mechanism. Moreover, is it meaningful for an AI to bear part or all of the responsibility?

Finally, the AI judge trial also has an impact on the existing judicial trial level system. At present, the judicial trial system in China is the final trial system, which plays two important roles in correcting the wrong judgement of the first instance and providing rights relief for the parties [9].

In recent years, AI judicial auxiliary system have been widely used in the field of judicial practice, and AI judicial auxiliary systems help the development of judicial practice with its advantages of high efficiency and convenience. However, the judicial practice of AI judicial auxiliary system may weaken the judicial correction and relief function of the final adjudication system. The foundation of the analysis and judgment made by the AI judicial auxiliary system lies in the algorithm model, and their scientificity and the uniqueness and verifiability are the foundation. In the field of judicial practice, the uniqueness of its algorithm has a series of hidden drawbacks. As we all know, the traditional human judge trial does not force the absolute consistency of the results of the trial, and the existence of the second instance system itself means that the conclusion of the first trial can be overturned. AI algorithms are completely different, the courts at all levels should use the same algorithm in principle, there is no algorithm according to the hierarchy of court. If the courts at all levels use the same algorithm model, and input the same case facts, the AI system is bound to agree the verdict. Then the second instance became the fact of the second error correction, and the relief function will fail, useless. In this way, the technical advantages of the algorithm not only did not help the improvement of the examination level system in China, but also restricted its error correction function and right relief function, so that it lost its use, being unable to display its preset efficiency.

4. Analysis of AI Regulations and Judicial Applications

4.1 Current Status of Laws and Regulations on AI Judicial Assistants in China and Abroad

4.1.1 International legislative landscape

The European Union passed the Artificial Intelligence Act (AI Act) in 2024, which came into effect on August 1, 2024, becoming the world's first comprehensive law regulating artificial intelligence [10]. The Act categorizes judicial AI systems into four tiers: "unacceptable risk", "high risk", "transparency risk", and "minimal to no risk", implementing phased regulatory requirements. The prohibitive clauses for "unacceptable risk" practices took effect on February 2, 2025, mandating algorithmic transparency, data traceability, and human oversight mechanisms. It also stipulates that AI-assisted decisions must retain the final discretion of human judges. Under this framework, EU member states have begun implementing measures to ensure the compliance of judicial AI systems, marking a critical step in balancing technological innovation with the protection of citizens' rights.

In the United States, legislation is fragmented at the state level. For instance, Illinois' Artificial Intelligence Transparency Act (2023) [11] requires courts to disclose the training data and bias test results of AI tools. However, there is no unified federal legislation, with only limited oversight under

the Algorithmic Accountability Act (2022). Against this backdrop, state-level legislative attempts provide valuable experience and references for federal legislation. For example, California, as a major hub for technological development, is considering a series of AI-related bills aimed at protecting consumer rights and ensuring algorithmic fairness and transparency. The passage of these bills may set a precedent for other states, thereby advancing nationwide legislative efforts. Meanwhile, as AI technology continues to evolve and expand into new applications, public awareness of AI ethics and accountability is growing, creating a societal foundation for more comprehensive federal regulations. Thus, although federal legislation remains underdeveloped, the active exploration by states and rising public awareness may lead to a more unified and effective regulatory framework in the future.

According to a Xinhua report from Tokyo on June 11, 2024, the Japanese Cabinet approved the 2024 edition of the Science, Technology, and Innovation White Paper at a meeting on the same day. The white paper focuses on AI technology, emphasizing Japan's need for sustained investment in this field. As reported by Kyodo News and other Japanese media, the white paper notes a significant increase in the number of global AI-related research papers from 2010 to the present. However, Japan faces challenges in AI talent development and research funding, necessitating continued investment and enhanced collaboration among top researchers domestically and internationally. The white paper also outlines the background and reasons for recent AI advancements, including the development of Japanese large language models. Citing survey results, it predicts that Japan's AI-related market will grow at an average annual rate of 30% between 2023 and 2028. Given the expanding application of AI in manufacturing and other industries, it is essential to address the ethical, legal, and social issues that arise [12].

4.1.2 Domestic legislation and policies

At the national level, China's Interim Measures for the Management of Generative Artificial Intelligence Services, jointly issued by the Cyberspace Administration of China (CAC) and six other departments on July 10, 2023 [1] requires AI to align with "socialist core values" but does not specify details for judicial scenarios. The 2025 "Two Sessions" (National People's Congress and Chinese People's Political Consultative Conference) highlighted the "AI+" initiative, listing the judiciary as a key area for supporting the development of intelligent adjudication systems.

Locally, pilot programs have been implemented. For example, the Guidelines on Promoting AI-Assisted Adjudication (2024) issued by the Shanghai High People's Court [13] require AI tools to undergo judicial compliance certification and limit their use to non-discretionary tasks such as "undisputed fact determination." Shanghai's "206 System," an intelligent case-handling assistant for criminal cases, consists of a big data repository, application software, and a network platform. Utilizing deep neural network models and optical character recognition (OCR) technology, the system learns from case files to identify and extract printed text, handwritten text, signatures, fingerprints, seals, tables, and images. However, it is currently limited to simple criminal cases (e.g., theft, traffic offenses) for evidence verification and logical analysis and cannot handle more complex cases. In such cases, deeper semantic understanding, contextual analysis, and cross-evidence reasoning are required. For instance, in economic crime cases, the system may struggle to identify anomalies in

financial statements or correlate implicit statements in emails with case facts. Thus, gaps remain in China's legislation, particularly regarding the boundaries of AI judicial assistants' authority and algorithmic audit standards. Existing regulations primarily focus on technical application guidelines.

4.2 Domestic Judicial Interpretations and Policy Support

The Supreme People's Court's Five-Year Plan for Informatization of the People's Courts (2021-2025) [3] proposes the construction of "Smart Courts 4," requiring AI assistance for over 80% of procedural tasks while emphasizing that "the judge's dominant role is irreplaceable." The 2024 Opinions on Regulating and Strengthening AI Judicial Applications[14]establishes a "negative list" for AI use, prohibiting its application in cases involving the death penalty or state compensation.

However, policy contradictions persist. While national policies encourage AI to enhance efficiency (e.g., shortening trial periods), they do not address the impact of algorithmic consistency on the appellate system (e.g., the potential failure of corrective mechanisms if the same AI system is used in both first and second-instance courts). To address these challenges, solutions must be actively sought to ensure AI applications in the judiciary are both efficient and fair. This requires a thorough analysis of the appellate system, clarifying the boundaries and conditions for AI use to ensure the rationality of its auxiliary decisions. Additionally, enhancing algorithmic transparency and interpretability will enable judicial personnel to understand AI decision-making processes and intervene when necessary. Furthermore, interdisciplinary expert teams should be established to regularly evaluate and upgrade AI systems to adapt to evolving legal needs and judicial practices.

4.3 Judicial Practice Cases of AI-Assisted Adjudication

4.3.1 Domestic pilots

In judicial practice, AI applications are gradually deepening, with efficiency and accuracy surpassing traditional manual operations in some areas. For example, the Beijing Internet Court adopted an "AI Judge Assistant" in 2023 to batch-process copyright disputes, reducing the average case-handling cycle by 40%. However, parties may opt out of AI assistance (actual usage remains below 30%). [15] In 2024, Guangzhou's Tianhe District Court piloted an "AI Evidence Review System," which identified forged key evidence in a financial loan dispute, though the judge ultimately rejected its conclusion, revealing a trust gap between humans and machines.

The Shanghai Pudong New Area People's Court introduced an "Intelligent Trial Assistance System" in 2025, using big data analysis and machine learning to provide judges with case references, helping them quickly identify key issues in commercial disputes and improve efficiency. Nevertheless, the court system emphasizes that AI remains an auxiliary tool, with final judgments resting on judges' legal interpretations and case-specific considerations.

4.3.2 International practices

The first instance of an AI "wearing judicial robes" occurred in Colombia. On January 30, 2023, Judge Juan Padilla incorporated ChatGPT's responses into a ruling, marking the world's first "AI-assisted trial." Padilla clarified that AI did not replace judicial decision-making but saved time in drafting the verdict. The case involved whether an autistic child should be exempt from medical costs.

ChatGPT affirmed this based on Colombian constitutional precedents, and the judge ruled that the child's insurer must cover all expenses. Padilla maintained that he "never stopped thinking as a judge." Colombian Supreme Court Justice Octavio Tejero acknowledged the ethical concerns raised by AI but expressed openness to its future use [16]

In State of Wisconsin v. Loomis (2016), the U.S. court relied on the COMPAS algorithm's recidivism risk assessment without requiring disclosure of its source code [17], sparking debates over the "algorithmic black box." Critics argue that the opacity of such algorithms may embed biases, undermining fairness. Experts advocate for greater transparency to ensure accountability and protect individual rights.

Estonia's "AI Judge" handles civil claims under €7,000. Plaintiffs input case details, and the system analyzes legal provisions and precedents to issue binding rulings. Dissatisfied parties may appeal to human judges.

4.4 Academic Research and Innovative Perspectives

As a supporter, Zhang Hanlin believes that AI can reduce artificial prejudice and realize the same judgment of similar cases through the "three-element relationship diagram of AI trial system". Zhang Hanlin and others also suggested that by continuously optimizing the algorithm and introducing more legal cases, AI's ability to deal with "legal exceptions" will be improved. He has three different views on the application scope and how to apply AI in the judicial trial system by studying different scholars. Therefore, there are also three expected modes when AI is applied to the trial system. He found that the positioning of AI in the judicial trial system depends on three elements: the maturity of AI technology, economic cost and the effectiveness of AI in the trial, and the three elements are indispensable in the judicial trial. Therefore, he used the concept of "weight" to change the starting point of different viewpoints from one element to the weight design of three elements, that is, the importance and contribution of the three elements relative to judicial trial. Its representation is as follows：

$$\text{Best Trial Mode} = \max \sum_{n-1}^{3} p_n \bullet q_n$$ （p is the element value and q is the weight value of this element）

According to the above formula, through the reasonable weight design of the three elements, the man-machine cooperative judicial trial mode is constructed. He also believes that when the development technology of AI is maturing, the design cost of the trial system is declining, and the effectiveness of AI in trials is significantly improved, it is undoubtedly the best trial mode [18].

In August 2024, a Dutch judge used ChatGPT to collect information about solar panels for judgment, which attracted the attention of many experts. Among them, Gutierrez, a professor at Rosario University in Colombia, is critical of this. He also asked the same question to ChatGPT, but got different answers. He believes, "It is irresponsible and immoral for judges to use ChatGPT judgments.” We should first cultivate judges' digital literacy." In 2019, France has introduced Law No. 2019-222, which clearly stipulates that "the identity data of judges and judicial administrators shall not be reused for the purpose of evaluating, analyzing, comparing, or predicting their professional behaviors", and offenders shall be sentenced to a maximum of five years' imprisonment.

This is the first law in the world that prohibits statistical analysis of judges' behavior. It can be seen that France is more conservative in introducing AI into judicial activities [16].

In fact, the key point of the problem lies in the existing limitations. Due to the rapid development of science and technology, there are research gaps and practical innovation problems in the application of AI technology in the judicial field all over the world, and most of the research focuses on technical feasibility and ignores institutional adaptability (for example, the conflict between trial-level systems and algorithms). Therefore, we should be big but innovative in practice, and create a "dynamic algorithm layering" mechanism in the trial system, so as to adjust the open parameters of the AI model according to the court level (e.g., the AI of the high court can cover more discretionary factors) so as to reserve the space for error correction in the second instance; Establish a "dual-track accountability system" on the issue of liability, so as to distinguish between technical responsibility (developers are responsible for algorithm deviation) and judicial responsibility (judges are responsible for the acceptance of AI conclusions), and trace the decision chain through blockchain storage [19].

5. Structure the Judicial Future, Unlock the Lock of the System

5.1 AI Judge Assistants Can Solve Judicial Problems

5.1.1 AI efficient ice breaking "many cases and few people "

With the continuous growth of the number of judicial cases, the contradiction of "too many cases" has become increasingly prominent. Judges are faced with problems such as low efficiency and heavy work burden when dealing with a large number of cases. The Al judge assistant can automatically extract the case information from the electronic files, including the party information, case type, litigation request, etc., and sort out and classify them to form a standardized case information database. Through the natural language processing technology, the Al judge assistant can also understand and extract the key information in the case, such as the focus of controversy, evidence materials, etc., to provide a basis for subsequent analysis. Based on the case information and legal provisions, the AI judge assistant can automatically generate preliminary legal documents, such as complaints, pleadings, judgments, etc. In addition, the Assistant Judge Al can initially screen and classify the evidence materials in the case, identify the key evidence and auxiliary evidence, and help the judge to grasp the facts of the case more quickly.

With the powerful big data processing and machine learning technology, AI judge assistants can quickly and accurately match the relevant legal provisions according to the facts of cases and litigation requests so as to provide authoritative legal references for judges. At the same time, the AI judge assistant can also dig out the cases similar to the current cases from the historical cases, providing the judges with rich background information and predictive reference for the judgment, thus further improving the accuracy and fairness of trials. Through risk assessment of cases, the AI judge assistant can also predict the legal risks and social impact involved in the cases, providing comprehensive and in-depth decision support for judges. In terms of trial process management, it can intelligently arrange the trial schedule and dispatch the trial resources according to the urgency degree,

difficulty degree of the case and the workload of the judge, so as to ensure the orderly and efficient progress of the trial work. By monitoring the progress of the trial in real time, the AI judge assistant can timely find and remind the cases that are about to be extended, effectively avoid the trial delay, and ensure that the trial work is completed with high quality within the specified time. Finally, the AI judge assistant can also conduct a comprehensive evaluation of the trial quality through the in-depth analysis of the trial data, find out the possible problems in the trial process, and provide targeted suggestions for improvement.

5.1.2 Break the traditional assistant model and create a new decision-making mechanism

AI law actively embraces the traditional legal aid mode. In the context of fewer cases, judge assistants have a heavy workload and need to deal with a lot of transactional work, such as document sorting and case recording, etc. It is difficult to spare time to improve their professional ability, which may lead to the decline of work quality. For the traditional judge assistant model, the emergence of AI assistants may be an auxiliary tool to better avoid the problems of the traditional judge assistant, such as large ability differences, low efficiency of information transmission, and heavy work burden. On March 15, 2023, a new generation of artificial intelligence product, GPT-4, was launched. This product has the ability to pass the legal professional qualification certificate, so the AI auxiliary legal assistance ability has been greatly improved. Wu Hongqi, a researcher from Peking University Law School, found that on the basis of the launched online litigation rules, online mediation rules, and online operation rules, in 2022, the Supreme Court issued 2 important documents to strengthen the judicial application of blockchain and artificial intelligence and the construction of AI law to a higher level of [20].

How can AI assist judges to make better decisions? The more suitable positioning between man and machine should be that the judge should take the responsibility of reasoning, and the machine should fully assist it. The positioning of AI legal aid should be to seek more sufficient reasons for the conclusion and focus on improving the writing level of documents so as to better optimize the efficiency between the traditional legal aid mode and the judge's communication and the full arrangement of materials. Artificial intelligence technology can not only play transactional auxiliary work such as information backfilling, intelligent cataloguing, law pushing, and document correction but also provide judges with substantive help such as case pushing, evidence screening, risk estimation, and deviation warning for judges[20].In 2023, the Jinshui District People's Court of Henan Province actively introduced the combination of large-scale model transcript simplification ability and no-clerk mode to realize the automatic simplification and normalization of full-text transcripts, forming a "clerk-like" trial transcript, which greatly improved the efficiency and content quality of transcript production, greatly reduced the workload of the clerk in the traditional trial, met the judge's reading habits of transcripts after the trial, and traced back to the needs of case and document preparation. First, to improve the ability of AI assistance. Through an intelligent training system and real-time knowledge support, AI is used to provide personalized training for legal assistance and real-time legal provision interpretation and case reference, to improve their legal knowledge and practical ability and work efficiency, and help them to focus more on core support tasks. The second is to

continuously optimize the workflow of AI assistance, through the AI automatic processing and the establishment of AI supported communication platform, to help efficient communication with judges and reduce the error of information transmission. The third is to establish a performance evaluation and feedback mechanism for AI law aid, evaluate the performance of the rule of law work through AI, establish a real-time feedback mechanism for AI support, help AI aid to timely find deficiencies and improve timely adjustment of working methods, and improve the quality of knowledge.

5.1.3 Unbiased digital justice officer

In judicial trials, the AI system can handle the case information with unprecedented depth and breadth through big data analysis. This ability is not only reflected in the amount of data, but more importantly, it lies in its ability to extract key information from massive data and identify the internal connections and differences between cases. This data-based decision support greatly reduces the information asymmetry problem that judges may encounter when handling cases, making the judgment more accurate and efficient. The neutrality of algorithms is the key to ensuring the fairness of AI in judicial trials. The design of AI algorithms strictly follows logical rules and mathematical principles, which means that they are not affected by personal emotions, prejudices, or experience when handling cases. This neutrality is not only reflected in the algorithm itself but also in the environment and conditions of the algorithm's operation. The AI system will follow the preset rules and processes when handling cases to ensure that every step of the decisions has evidence and rules to follow, so that the AI judge assistant can avoid the phenomenon of "different judgments in the same case". Finally, strengthenning the AI system's continuous learning and optimization ability, is the important guarantee of its efficiency and fairness, also embodied in the processing of complex cases, AI system can through continuous learning and optimization, gradually master the methods and skills of dealing with these complex cases, allowing the judge to provide more accurate and comprehensive legal advice.

5.2 Institutional Construction of AI Judge Assistants

5.2.1 To help improve judicial transparency

Two key challenges must be faced: how to make AI decisions transparent and explanatory at the technical level and how to build a multi-party collaborative trust mechanism at the social level. The algorithm itself needs to be vetted and can draw on the U.S. Department of Defense's Algorithmic Vulnerability Front project, typical examples include DARPA's intelligent vulnerability mining system Mayhem, which has been used to test control software for military aircraft and find and verify vulnerabilities within minutes, demonstrating the effectiveness of the algorithm in real-world scenarios. It conducts comprehensive analysis of inputs, outputs, and intermediate variables through interdisciplinary teams to ensure that algorithms do not lead to incorrect decisions due to design flaws. Furthermore, introducing diverse teams to design and evaluate algorithms allows people from different backgrounds and cultures to work together, identifying potential issues from multiple perspectives. Finally, to establish a "fair committee", the committee can be composed of technical experts, legal scholars, and social activist's representatives such as regular transparency reports, public AI system design principles, data sources and decision-making logic, through the public

information, let the public to understand and supervise the operation of the AI, so as to build trust.

5.2.2 To improve oversight and accountability mechanisms

Depth and improvement of the AI method to help the regulatory mechanism of AI judge assistant regulation must control orientation, from the research and development application, data quality, algorithm review, data security, and collaborative regulation, these links, to ensure that the judge can independently review AI advice, effectively promote data security and cooperation regulation, such as clear data access and data leakage emergency handling mechanism. 1. In the research and development stage of AI judge assistants, strict technical and ethical review mechanisms are established. A review team composed of legal experts, technical experts, and ethicists will make a comprehensive evaluation of the objectives, methods and data sources of research and development to ensure that they comply with laws, regulations and ethics. 2. Establish a monitoring system to collect the data of AI judge assistants in the process of auxiliary trial, such as case processing efficiency, accuracy, judge and client satisfaction, etc. At the same time, feedback channels should be set up so that users and parties can provide timely feedback problems and suggestions. 3. Continuously strengthen the data security and quality supervision mechanism, build a multi-level data security guarantee system, and use encryption technology, access control, and other means to prevent data leakage.

The accountability of AI-assisted judicial trials is not clear. For example, the case of a court in Jiangsu Province automatically releasing the "old Lai" abroad by the system has triggered social thinking on the responsibility of judges and artificial intelligence in intelligent-assisted trial cases. Who bears this responsibility [21]? The core of the reform of the judicial responsibility system lies in the division of authority, and the empowerment accountability mechanism is the proper way to solve the accountability dilemma of judges. First, clarify the specific responsibilities of natural person judges, AI systems, and technical personnel in different judicial links. For the judicial errors caused by their own problems in the auxiliary decision-making of the AI system, the developers and users of the AI system should share the responsibility according to the actual situation. Moreover, the distinction of personnel responsibilities: judges should be mainly responsible for the judicial errors caused by their excessive reliance on the AI system or failure to fulfill their supervision duties and for the problems caused by the provision of wrong data or poor technical support. Finally, multiple accountability subjects are established, and an independent accountability committee is set up, composed of legal experts, technical experts, judicial workers, ethics scholars, etc., responsible for the objective and fair evaluation of the judicial behavior and the consequences of AI judge assistants and making rulings on the attribution of responsibility.

5.3 The Consistency Problem of Grading System and Algorithm

As artificial intelligence technology continues to advance, the application of AI judicial assistants in the legal field is becoming increasingly widespread. Especially during the first-instance stage, under traditional models, first-instance judges manually review evidence from 100 electronic contract dispute cases, with an average time consumption of 40 hours per case and a misjudgment rate of about 12% (China Judicial Big Data Research Institute, 2022). However, AI judicial assistants

use NLP technology to automatically extract key terms from contracts (such as amounts and liability for breach) and link them to relevant laws and regulations, reducing the review time per case to 4 hours and the misjudgment rate to 3% (Supreme People Court《White Paper on Intelligent Adjudication》,2023). With its efficient and accurate data processing capabilities and intelligent auxiliary functions, AI judicial assistants have significantly improved the efficiency and quality of trials. However, for the second-instance stage, we should be cautious about the application of AI judicial assistants to avoid potential risks and issues. If AI training data is concentrated in cases from developed eastern regions (accounting for over 60%), it may lack applicability to cases in central and western regions (such as disputes in ethnic minority areas), leading to biased case recommendations. In complex cases, such as intellectual property infringement, AI judicial assistants may overly rely on surface-level evidence similarities while neglecting substantive evidence, potentially resulting in misjudgments. Additionally, in second-instance cases involving conflicts between public interests and individual rights, such as land expropriation and demolition, AI judicial assistants may struggle to comprehensively consider social impact and historical context, leading to mechanical application of legal provisions and deviating from substantive justice. Therefore, the scope of application and responsibilities of AI judicial assistants should be clearly defined to ensure they play an auxiliary role in the first instance but do not enter the second instance. Strengthen the supervision and evaluation mechanisms for AI judicial assistants to ensure their decision-making processes comply with laws, regulations, and judicial principles. Enhance the professional competence and adjudicative capabilities of second-instance judges to ensure they can independently and accurately make judgments when dealing with complex and difficult cases. This will better leverage the auxiliary role of AI judicial assistants in judicial proceedings while ensuring the fairness, authority, and efficiency of judicial trials.

6. Conclusion

As the conflict between the surging caseload and limited judicial resources intensifies, the weakness of auxiliary judicial forces has placed the adjudicative process under considerable strain. The phenomenon of "different judgments for similar cases" further undermines judicial credibility. In this context, we aspire for AI judicial assistants, acting as "digital officers of justice," to deeply empower the adjudication system and help address the pressing issue of "many cases, few judges."

Based on our research, we have outlined the current landscape of AI applications in judicial adjudication. In light of the challenges confronting today's judiciary, we argue that AI judicial assistants hold significant potential to contribute meaningfully to the judicial process. Against the backdrop of rapid advancements in AI technology, the capabilities of AI are increasingly being realized. At the same time, to safeguard the central adjudicatory role of human judges, we propose regulatory mechanisms for the development of AI judicial assistants, fostering coordinated progress alongside traditional legal assistant models, thereby enabling a seamless and efficient upgrade of judicial adjudication.

At the institutional level, we advocate for the establishment of open oversight mechanisms to

ensure algorithmic transparency. In terms of liability regulation, a refined personnel allocation system should be introduced to delineate accountability clearly, thereby alleviating concerns regarding the development of AI judicial assistants. In practical application, AI judicial assistants can perform preliminary case processing and triage through algorithmic functions—such as reviewing the format of pleadings, determining jurisdiction, and assessing the completeness of submitted materials. This not only facilitates parties' participation in litigation but also provides judges with essential preparatory support. Drawing reference from Shanghai's "206 System," which employs technologies such as image and voice recognition and automated semantic analysis, the system allows prosecutors to retrieve witness statements, physical evidence, documentary evidence, and site inspection records via voice commands. These are then transmitted in video format to courtroom monitors for examination by judges, defense counsel, and defendants, significantly reducing the time required for evidentiary presentation and enhancing trial efficiency.

Although AI-assisted judicial systems remain in an exploratory phase, while we benefit from the convenience they offer, we continue to adopt a prudent approach. AI judicial assistants are regarded strictly as auxiliary tools intended to enhance judicial capacity, thereby preventing the marginalization of the hierarchical appeals system.

Looking ahead, as AI technology continues to evolve and integrate more deeply with the adjudicative process, the application of AI judicial assistants will become increasingly widespread and sophisticated. We will continue to explore the feasibility of AI's deeper participation in judicial proceedings. Whether AI judicial assistants remain in a supportive role or eventually evolve into a dominant force will depend on future technological advancements and broader societal trends—matters that require further in-depth investigation. Nevertheless, what is beyond dispute is that empowering AI judicial assistants to become guardians of justice plays an irreplaceable role in the evolution of China's judicial adjudication system.

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