Artificial Intelligence in Judicial Systems

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Abstract. This paper attempts to explore the integration of Artificial Intelligence (AI) into modern judicial systems. Through a systematic literature review based on the PRISMA methodology, the study initially examines the use of AI technologies, such as machine learning, natural language processing and generative AI, in justice, and then examines some advanced applications of AI in the judicial systems of some pioneering countries in this area, including China, the United States, Argentina, the Netherlands, France, Italy and the United Kingdom. The paper presents some pioneering practices, such as Smart Courts in China, the "Prometea system" in Argentina, "Predictive Justice" in Italy, and "Judge Analytics tools" in the U.S. and the Netherlands. At the same time, it highlights some ethical and legal issues arising from the application of AI in justice: algorithmic bias, transparency, accountability and protection of personal data. The paper concludes that AI can become a valuable tool for enhancing the efficiency, speed, and accessibility of justice, provided it is implemented within a robust institutional, ethical, and human-centered framework.

Keywords: Artificial Intelligence, Generative AI, Justice, Judicial System, Legal Technology.

1   Introduction

The Artificial Intelligence (AI) is evolving as one of the most innovative drivers of transformation within public institutions, with the justice sector representing one of its most sensitive and critical areas of AI use. AI technologies, such as machine learning, natural language processing, and generative AI, offer capabilities that extend beyond the mere administrative support of court operations and reach into the very process of judicial decision-making [1, 2]. Globally, judicial systems are attempting to modernize their procedures by leveraging AI technologies to accelerate the delivery of justice, reduce operational costs, and enhance accessibility for both citizens and professionals.

However, despite its potential for providing significant benefits, the application of AI in the domain of justice raises significant ethical and legal concerns: issues such as algorithmic transparency, the avoidance of bias, the protection of personal data, and accountability constitute core challenges that must be addressed to ensure that AI-supported judicial decisions uphold the fundamental principles of justice [3, 4].

This study is situated within this transitional landscape and aims to analyze the use of AI in the field of justice, as well as the institutional and ethical issues that arise, and

also the best practices developed both internationally and at the European level. In the following section 2 our methodology for conducting a review of relevant literature is described. Then section 3 explores the use of AI in justice, section 4 presents the most advanced applications of AI in judicial systems worldwide, while section 5 highlights some ethical and legal issues arising from the application of AI in justice. The final section 6 summarizes our conclusions.

2   Methodology Literature Review

The methodological approach of this study was based on a systematic literature review, which included scientific articles, books, research papers, reports, and digital sources. Following the internationally recognized PRISMA standards (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) [5], the review aimed to identify, evaluate, and synthesize the most recent and reliable research studies on the use of AI in the judicial system. The process consisted of three main stages: first, the search for sources; second, the inclusion and exclusion criteria; and third, the categorization and thematic grouping of the sources.

2.1   Source Search

The search was conducted using the following academic databases: Scopus, Google Scholar, IEEE Xplore, SpringerLink, Elsevier Science Direct, SSRN, arXiv, and legal databases such as Westlaw, EUR-Lex, among others. Search terms included: "Artificial Intelligence in Justice", "AI and Legal Reasoning", "Predictive Policing", "Ethics of AI in Judiciary", "AI Legal Frameworks", "Algorithmic Fairness", and "Regulation of AI in Law."

2.2   Source Selection Criteria

The selection of sources was based on the following criteria: publications dated from 2015 onward, with particular emphasis on the period 2020–2024, inclusion in peer-reviewed scientific journals and content specifically relevant to the application of AI in judicial or legal contexts. Empirical data and case studies were also considered.

2.3   Analysis and Grouping of Sources

Based on our analysis of the sources we found, we can distinguish five main groups: the first of them are dealing with the use of the 'classical' machine learning oriented AI for justice-related predictions (predictive justice), while the second group focuses of the use the more recently developed generative AI in justice, and the third group aims to develop advanced AI tools for legal research. A fourth group of sources examines the use of AI in the judicial systems of certain countries that have made considerable progress in this area. Finally, there is a fifth group of sources that deal with the ethical and legal issues arising from the application of AI in justice.

3   The Use of Artificial Intelligence in Justice

AI has begun to play a significant role in shaping the judicial system, bringing revolutionary changes to the administration of justice. From the early stages of "classical" AI, which focused on machine learning, to the recent development of generative AI (such as ChatGPT), this technology has introduced new tools and approaches that are transforming court operations, policing, and legal research.

AI has been integrated into judicial functions mainly through text-processing systems, which include speech-to-text and anonymization technologies for court decisions [6]. Speech-to-text processing has been used for years in everyday applications and is now being implemented in judicial proceedings, enabling judicial officers to record hearings in real time. At the same time, anonymization systems are used to adapt court decisions to data protection regulations by automatically removing sensitive information, contributing to significant time savings. Both applications allow users to verify the results and are not subject to the European AI regulation. In contrast, applications that are directly involved in legal decision-making are classified by the EU as "high-risk" [1].

However, these systems have faced criticism for various reasons, including algorithmic bias, lack of transparency and accountability [7], as well as users' difficulty in understanding AI, which may affect the administration of justice [8]. The inability to explain the suggestions provided by AI systems [9] may lead to their undue influence on judicial proceedings [10]. Moreover, the "black box" phenomenon [11] is exacerbated when such systems are owned by private companies that do not provide third-party access, creating transparency issues. Finally, the potential for judicial pathologies arising when judges uncritically accept algorithmic decisions constitutes an additional concern.

3.1   Predictive Justice

The predictive systems currently in use or under development fall into various categories, such as those that assess the risk of reoffending and those that support decision-making, either as sentencing tools [12] or as mechanisms for predicting court rulings. The latter are based on statistical analyses and probabilistic calculations aimed at identifying previous similar cases, offering suggestions regarding the likely outcome of legal disputes. While these systems are designed solely for prediction and decision-making support, Generative AI (GenAI) is characterized by broader functionality. GenAI enables interaction with users through question-and-answer exchanges, autonomously generating texts, images, and sounds. Due to this flexibility, European legislation classifies GenAI under "general-purpose artificial intelligence systems". The content produced by these systems is probabilistic, based on statistical correlations shaped during their training process [13].

"Classical" AI is used for data management and decision-making, with notable examples including recidivism risk assessment and predictive policing. This technology has contributed to more efficient decision-making and resource management while also raising concerns regarding its ethical use, transparency, and societal impacts. Predictive

justice systems are designed to forecast potential outcomes of legal disputes by drawing on previous decisions in similar cases. They rely mainly on supervised machine learning methods, in which data is first labeled and then algorithms are trained to identify patterns and estimate outcomes. These systems are considered "high-risk" under the EU Artificial Intelligence Act.

An example of a predictive justice application includes the work described in [14, 15], which were developed to predict decisions of the European Court of Human Rights (ECtHR) [14, 15]. The researchers focused on cases related to Articles 3, 6, and 8 of the European Convention on Human Rights, using natural language processing and machine learning techniques. The system predicts whether the Court will find a violation of a Convention provision with 79% accuracy. It is based on data from previous rulings available in the ECtHR's database. When a new case is entered, the algorithm compares its description with older cases, searching for similarities. Based on this analysis, it produces a prediction regarding the likely decision of the Court. This process is grounded in the logic that patterns in texts from past decisions can provide insights into the outcome of new cases.

Similar systems, such as those implemented in the Courts of Appeal of Brescia and Venice, allow users to search for cases with similar characteristics through predefined topics or natural language input [9]. These systems, which are gaining acceptance even in civil law countries such as Italy, facilitate the judicial process by transforming case law into data suitable for analysis and prediction. Despite their limitations, these systems are increasingly adopted in countries like Italy and France, integrating AI techniques for the analysis of court rulings. They convert judicial reasoning into processable data, improving the ability to identify and predict outcomes in complex legal cases.

Predictive systems are also expanding into prosecutorial decision-making, as demonstrated by the work of Chinese researchers in 2021, who developed the first AI-powered prosecutor. Tested in Shanghai, this system was trained on 17,000 real cases from 2015 to 2020 and was able to press charges for the most common crimes with 97% accuracy [16]. The philosophy behind such systems is based on the idea that the law, as an objective and repetitive set of rules, can be predicted through big data analysis and machine learning techniques. These models aim to replicate legal reasoning by extracting structured knowledge from past court decisions.

On the other hand, generative AI has ushered in a new era in justice, enabling the creation of original content and helping both citizens and professionals become familiar with complex legal issues.

Despite significant progress, these two forms of AI have different applications, capabilities, and limitations. While "classical" AI is ideal for data analysis and decision-making based on statistical predictions, generative AI offers a more creative approach, making it particularly useful in areas such as legal education, automated document drafting, and the provision of legal advice. However, both types of technology present challenges, such as the need for transparency, the mitigation of algorithmic biases, and the preservation of human involvement and dignity in the justice process.

3.2 Generative Artificial Intelligence (GenAI) in Justice

GenAI systems, such as ChatGPT, CoPilot, or Gemini, represent a new generation of applications that are increasingly being used in judicial procedures [17, 18]. These systems are based on Large Language Models (LLMs) and operate through probabilistic calculations to predict the next word in a sentence. Chatbots that utilize GenAI respond in natural language, providing answers based on pre-trained data [19].

In the field of legal work, these systems can perform multiple functions, such as summarizing documents, isolating facts from different testimonies, or identifying similarities and differences in narratives. Users can also ask the system to distinguish between agreed and disputed issues or to evaluate the arguments of the prosecution against those of the defense. In more complex cases, a judge may request suggestions from a GenAI system to aid in decision-making. Before analyzing the use of GenAI systems in judicial proceedings, it is essential to understand their practical application and to define the framework for acceptable use.

Suspicions that judicial officials were privately using these systems in their workplaces have been confirmed, as reports began to emerge indicating the integration of GenAI into judicial decisions. Although the evidence remains mostly anecdotal, it is steadily growing [10]. The first known case was recorded in February 2023 in Colombia, where a judge used a GenAI system to decide on health insurance coverage for an autistic child. The dialogue between the judge and the system was cited in the ruling, sparking public discussion [20]. In March 2023, an Indian judge requested advice from ChatGPT on whether to grant bail in a homicide case [18], while around the same time, a Pakistani judge used ChatGPT to define the legal concept of "consent" in a sexual assault case [21]. In September 2023, a British appellate judge admitted to asking ChatGPT to summarize a legal area in which he was already an expert, finding the answer satisfactory and incorporating it into his ruling [22]. More recently, a Dutch judge was criticized for using ChatGPT to calculate compensation, asking for data on the "average electricity price" and the "lifespan of solar panels" [23].

The above cases became known because judges disclosed their use of GenAI systems in decision-making, highlighting the possibility of informal and unregulated application of these technologies. There is also evidence that other legal professionals, such as lawyers and prosecutors, resort to the use of GenAI in a similar informal manner [24]. These cases confirm the great flexibility and multiple uses of GenAI, ranging from legal analysis to direct decision-making. For example, as mentioned above, in Pakistan, GenAI was used to define a legal concept, while in England it was employed to summarize a legal field. In India, it was used to explore the conditions for granting bail, whereas in Colombia the system was directly utilized to support a decision in a health insurance case. These diverse applications demonstrate how GenAI can be adapted to the needs of judicial processes.

The increasing experimental use of chatbots in judicial procedures has led various bodies to issue guidelines regulating their use [10]. In December 2023, the Judiciary of England and Wales published the first specialized guidance on the application of GenAI in judicial proceedings [25]. The document highlights serious limitations and risks associated with GenAI, while simultaneously proposing restricted uses. The guidelines

point out that any information entered into a public chatbot becomes globally accessible, making the use of confidential data inappropriate. They also emphasize that GenAI systems exhibit errors such as fabricating nonexistent cases, citations, or legal texts, as well as providing misleading information or incorrect data. Since GenAI responses are based on the datasets on which they were trained, errors and biases embedded in these datasets are reproduced. Moreover, in the legal domain, it can be difficult to ascertain whether the responses pertain to jurisdictions such as the US, the UK, or other countries.

Despite these limitations, the guidelines recommend using GenAI only for secondary activities, such as summarizing texts (provided summaries are checked for accuracy) or drafting emails and notes. However, they discourage the use of GenAI for legal research or activities directly related to cases. It is not necessary for judicial officers or legal representatives to disclose their use of GenAI, provided they use it responsibly. Judges remain personally accountable for the decisions they issue, while legal representatives must ensure the accuracy and appropriateness of the material they submit [25].

3.3   Leading Artificial Intelligence Tools for Legal Research

The use of AI in the field of legal research has brought significant improvements in efficiency and accuracy, making it an integral part of modern legal practice. Some of the leading AI tools for legal research include LexisNexis' "LexisAnswers," WestlawEdge's "Westlaw AI," Casetext's "Counsel" (now owned by Thomson Reuters), "ROSS Intelligence," and "JuryOS." These tools utilize advanced algorithms to enhance the way legal research is conducted, providing comprehensive and accurate solutions in real time [26].

LexisNexis' "LexisAnswers" employs natural language processing (NLP) technologies to understand queries posed in natural language and deliver relevant information from databases, saving time and facilitating the synthesis of prior cases [27]. Similarly, Westlaw AI, integrated within WestlawEdge, focuses on providing predictive analytics and identifying key legal precedents, enabling legal professionals to recognize trends and make better-informed decisions [28]. Casetext's Counsel combines AI with advanced search tools, delivering personalized results directly related to the nature of the case [29]. The ROSS Intelligence platform, known for its speed, allows lawyers to locate critical information and legal arguments within seconds, drastically reducing research time [30]. Finally, JuryOS is a specialized AI-based platform that provides data aiding jury selection strategies and case management. It combines data and behavioral analysis to support more informed decisions in the courtroom [31].

Today, many sophisticated AI tools are used for document automation and management, offering solutions for various needs and requirements. Tools like Docupilot, KlippaDocHorizon, HotDocs, and Gavel.io specialize in document creation and processing, while others such as CongaComposer and ExperLogix focus on automating complex workflows. Additionally, Jotform and PandaDoc provide solutions for form creation and contract management, whereas tools like ClickUp combine document management with broader organizational capabilities. These platforms leverage AI technologies to

save time, reduce errors, and improve accuracy in handling large volumes of documents, enhancing functionality in both business and judicial environments [32].

4   Advanced Applications of Artificial Intelligence in Judicial Systems Worldwide

The global trend toward integrating AI technologies into justice represents a profound reformative process with multidimensional implications. While AI systems are at different stages of implementation across countries, certain jurisdictions have emerged as pioneers, adopting innovative tools that influence key aspects of justice delivery—from case management automation to predictive analytics and judicial support. In this section we describe the most advanced AI applications in the judicial systems of these pioneering countries: China, the United States, Argentina, the Netherlands, France, Italy and the United Kingdom.

4.1   China

China is among the countries with the most radical and ambitious integration of Artificial Intelligence into its judicial system. Driven primarily by the "Smart Court" initiative, the People's Republic of China has undertaken a comprehensive digital transformation of its justice system, introducing innovative technologies that automate a wide range of functions, from electronic filing and document analysis to decision-making and citizen support through interactive systems [33].

A notable example is the Beijing Internet Court, where the "AI Judge" was introduced in 2018—an interactive robotic judge that guides litigants in submitting legal documents and navigating judicial procedures. China is also pioneering the use of judge holograms, which temporarily "replace" human judges in standard hearings, pre-trial or administrative procedures, and remote sessions. These systems are used primarily in low-complexity cases. Citizens can access judicial services remotely, thereby improving accessibility and the overall efficiency of the system [34]. Furthermore, the digital courts of Hangzhou and Guangzhou employ AI to automatically generate document summaries, analyze case data, and classify case types, facilitating faster processing and reducing the backlog in physical courts. The entire process is managed online, drastically reducing the time and cost associated with the delivery of justice [35, 36].

However, the Chinese case also raises significant ethical and governance concerns. The extensive use of AI limits algorithmic transparency and diminishes the discretion of human actors. Dependence on predictive and automated decision-making systems provokes concerns regarding bias, lack of accountability, and the exacerbation of social inequalities, especially when sufficient oversight and appeal mechanisms are lacking. Despite these concerns, China continues to invest in the development of AI within the justice sector, aiming to establish a "digital court of the future." This case exemplifies technological leadership, while simultaneously highlighting the urgent need for regulation, transparency, and oversight in the use of AI in such a sensitive institutional context [33, 34, 35].

4.2   United States of America (USA)

The United States is a pioneer in the application of artificial intelligence tools within the field of criminal justice, with particular emphasis on risk assessment systems, predictive analytics, and "Judge Analytics".

The COMPAS system (Correctional Offender Management Profiling for Alternative Sanctions), along with LSI-R, PSA, and PCRA, is used to evaluate the likelihood of recidivism among offenders [37, 38, 39]. Additionally, platforms such as ROSS Intelligence and Judge Analytics tools enhance lawyers' ability to predict judicial behavior and decision-making patterns [40]. These systems collect and analyze data from questionnaires, demographic information, criminal history, social factors, and behavior in prison in order to estimate the risk of recidivism or failure to appear in court. The analysis is based on scoring scales and is applied at various stages of the criminal justice process. COMPAS integrates more than 137 questions and analyzes data from over 2.6 million offenders. Similarly, PSA uses public data from 1.5 million cases and deliberately avoids socioeconomic variables for reasons of objectivity [41, 42]. The use of neural networks in Judge Analytics systems reveals patterns in judicial decisions and strategically supports legal defense [40].

Despite their widespread use, the COMPAS system has been criticized by organizations such as ProPublica for racial bias and questionable accuracy [43, 44]. Although powerful, these algorithms often function as "black boxes," making their decisions difficult to interpret and raising concerns about transparency and accountability.

4.3   Argentina

Argentina stands as a characteristic example of a state that, despite limited resources, has managed to develop and implement advanced AI solutions in the field of justice. The innovative system Prometea, launched in the Office of the Public Prosecutor of Buenos Aires in October 2017, represents a comprehensive approach to the automation of legal processes [45, 46]. Prometea is a product of machine learning and is designed to support public legal services at multiple levels. Based on a database containing over 300,000 documents, 1,400 templates of legal opinions, and 2,000 judicial decisions, the system can process incoming data, retrieve relevant information, and draft preliminary versions of legal rulings.

The operational model of Prometea is structured across three levels of automation: fully automated, semi-automated, and manual processes. Within specific prosecutorial services, 169 types of activities have been identified, of which 54 can be executed without human intervention, 41 require limited oversight, and the remaining 74 remain under exclusive human control [47]. The key advantage of Prometea is the significant reduction in case processing time. Administrative procedures that previously took up to six months can now be completed within six weeks. Its operation enhances the productivity of legal personnel by providing ready-made draft decisions, which are ultimately approved by competent prosecutors or judges, ensuring constitutional compliance.

The success of Prometea has sparked international interest, with its technology being adopted by public agencies and courts in other Latin American countries and Spain. Notably, the system has also been implemented in the Constitutional Court of Colombia, demonstrating its scalability even in more complex judicial environments [48].

Although Prometea serves as a supportive mechanism rather than a full substitute for the judge's role, it lays the groundwork for establishing a more evidence-based, swift, and efficient administrative justice system, proving how AI can be successfully leveraged even in emerging legal markets.

4.4   Netherlands

The Netherlands serves as a characteristic example of a country implementing artificial intelligence (AI) in its judicial system with a focus on innovation, speed, and efficiency. Since 2010, the e-Court dispute resolution platform has been operational, enabling disputing parties to resolve financial conflicts remotely without the need for physical presence or direct human intervention in the initial stages of the process [5]. The procedure involves the electronic submission of required documents, which are processed by an AI system. This system issues a preliminary decision, which is then sent to a regular court as a draft. Judges subsequently review and either approve or modify the decision before it is enforced. This hybrid model of human oversight and machine analysis has significantly contributed to reducing delays and improving efficiency in the administration of justice.

Of particular importance is the experimental program conducted at the East Brabant Regional Court, in collaboration with Tilburg University, the Eindhoven University of Technology, and the Jeronimus Academy of Data Science (JADS). The study focuses on applying AI to support judges in administrative cases, such as appeals for traffic code violations. The system utilizes data from approximately 100,000 cases from provincial and appellate courts, aiming to develop predictive and analytical tools [5].

The Dutch case highlights AI's potential to alleviate court congestion through tools based on large-scale legal data. At the same time, the gradual adoption of these technologies is supported by institutional safeguards, including collaboration with academic institutions and adherence to ethical principles.

4.5   France

France presents a distinctive case of AI integration into its judicial system, demonstrating a dual strategy: on one hand it encourages innovation and the adoption of smart tools, while on the other it establishes strict rules to safeguard the independence of judicial functions.

On the technological front, France utilizes AI platforms such as Predictice and Case Law Analytics [49, 50, 51]. Predictice analyzes previous judicial decisions, providing predictions about potential outcomes of future cases, helping legal professionals make evidence-based decisions. Meanwhile, Case Law Analytics offers statistical data and success probabilities based on past rulings, enhancing consistency and speed in judicial decision-making.

However, on the institutional front, France goes a step further. Article 33 of Law 2019-222 explicitly prohibits the use of data related to judges' identities for evaluating, comparing or analyzing their judicial activity. Violation of this rule is punishable by up to five years imprisonment and fines up to €300,000 [52]. This approach successfully maintains the balance between digital transformation and protection of fundamental rule-of-law values. It serves as a model of responsible and institutionally safeguarded AI integration in the justice sector, demonstrating how technological progress can be achieved without compromising judges' independence and impartiality.

4.6   Italy

Italy has made significant efforts towards the digital transformation of its judicial system, combining the adoption of advanced Artificial Intelligence technologies with an emphasis on transparency and interpretability of algorithms. The main pillar of this effort is the "GiustiziaDigitale" initiative, which integrates AI tools for processing legal documents, generating case summaries, and classifying legal topics.

Of particular interest is the research "project PRODIGIT", developed to support tax judges and lawyers. This initiative utilizes large language model (LLMs) techniques, such as GPT-4, to extract legal information and create case summaries, with results evaluated positively by specialized professionals [53].

Another innovative endeavor is "Predictive Justice," piloted at the Genoa Court in collaboration with the Scuola Superiore Sant' Anna of Pisa. This project develops explainable machine learning (Explainable ML) techniques to assist judges in decision-making while maintaining the ability to control and understand algorithmic outputs. The project analyzes court rulings, identifies patterns of legal reasoning, and attempts to represent the reasoning process leading to the formation of decisions [54]. "Predictive Justice" is divided into five development levels, from decision analysis and automatic information extraction to decision prediction and structural analysis of legal arguments. Although still in a pilot phase, the project incorporates both transparent methods and more complex deep learning techniques, seeking to balance technological progress with legal accountability.

The Italian case demonstrates how AI can function as an auxiliary to judicial judgment without replacing it, emphasizing the importance of interpretability and ethical accountability as essential parameters in any effort to automate judicial reasoning.

4.7   United Kingdom

In the United Kingdom, AI has been adopted at multiple levels of the judicial as well as in the policing system, with the primary goal of increasing efficiency and enhancing predictability. Particular emphasis has been placed on so-called predictive policing tools as well as the analytical evaluation of judicial data through tools such as Judge Analytics.

The HART system (Harm Assessment Risk Tool) is used by the country's authorities to assess the risk of criminal behavior based on social, geographical, and criminal data [55]. Similarly, the Pred Pol platform, mainly applied within police services, relies on

algorithms that identify crime patterns and guide the allocation of police resources to "high-risk areas."

In the legal sector, the United Kingdom invests heavily in the development of AI-powered legal research platforms such as Westlaw UK and LexisNexis UK, which utilize NLP and classification algorithms for faster and more accurate searches of case law, legislation, and related documents [28]. Additionally, experimental tools for predicting trial outcomes through analysis of past decisions have been tested.

One of the most interesting examples is LawtechUK, a government-supported program that promotes collaboration between the Ministry of Justice, the technology industry, and universities. Through this platform, AI solutions are developed to support alternative dispute resolution, guide citizens through legal processes, and disseminate AI ethics at professional and academic levels [56]. Also notable is the work of the Alan Turing Institute, which provides training to public entities on the responsible use of AI, while the University of Oxford investigates AI-based legal service business models and evaluates their impact on legal skills [57].

The United Kingdom serves as a characteristic example of a country combining applied AI tools with institutional preparation and research, maintaining a high level of cooperation among governmental, private, and academic actors.

5   Ethical and Legal Issues Arising from the Application of Artificial Intelligence in Justice

The application of AI in the field of Justice raises a broad range of ethical and legal issues related to the fundamental principles of the rule of law and the institutional independence of the judiciary. The use of algorithms in the administration of justice, the prediction of judicial decisions, or risk assessment brings to the forefront critical challenges such as transparency of decisions, explainability of outcomes, avoidance of discrimination, and ensuring accountability.

One of the most contentious issues is the potential for algorithmic bias [59], which can reproduce or amplify existing inequalities. Tools like COMPAS in the United States have faced severe criticism, as studies revealed significant discrepancies in the accuracy of predictions depending on the racial or social background of defendants [43, 60]. Similar concerns have been raised regarding other risk assessment algorithms, such as PSA and PCRA, although their creators claim they rely solely on neutral statistical data [41, 42].

The lack of transparency in algorithms, especially in cases where deep learning techniques are used, makes the process of interpreting and scrutinizing decisions difficult. In response to this risk, some judicial systems, such as the Italian Predictive Justice project, opt to implement explainable machine learning approaches to enable legal professionals themselves to understand how the algorithms operate [54].

At the same time, the issue of accountability arises strongly. When a decision is based on (or significantly influenced by) algorithmic evaluation, the precise allocation of responsibility between human and machine factors becomes unclear. Maintaining

the responsibility of the human judge is critical for ensuring justice, as emphasized by the practical application of Prometea in Argentina, where the final approval of the decision remains exclusively with the judicial staff [46].

Additionally, the protection of personal data is inextricably linked to the use of AI. Compliance with the General Data Protection Regulation (GDPR) and becomes fundamental, especially in systems that collect and process sensitive information. The ethical use of AI also requires continuous education of legal professionals and judges. Initiatives such as the United Kingdom's collaboration with the Alan Turing Institute on AI ethics training underscore the importance of developing ethical and technological skills within the justice sector [56]. The design of algorithms, criteria for data training, and understanding of their impact on judicial work must be addressed as matters of public accountability and democratic governance.

6   Conclusions

In the previous sections of this paper the multifaceted use and impact of AI on contemporary judicial systems have been examined, both as a technological tool and as a regulatory and ethical challenge, based on a review of relevant literature. From analysis it can be concluded that the use of AI in the judicial systems can offer significant benefits: it can accelerate the delivery of justice, reduce operational costs, and enhance accessibility for both citizens and professionals; at the same time there are some important ethical and legal issues that arise from the application of AI in justice: algorithmic bias, transparency, accountability and protection of personal data.

From automating administrative procedures to supporting judicial decision-making, AI applications vary significantly across countries, reflecting differing technological maturities, cultural sensitivities, and institutional priorities. The international comparative overview showcased pioneering examples such as Prometea in Argentina, Smart Courts in China, Predictive Justice in Italy, and JudgeAnalytics platforms in the United States and the Netherlands. These examples demonstrate AI's potential to increase efficiency, reduce delays in the delivery of justice, and improve access for citizens.

However, the integration of AI into justice systems is not without risks. Issues such as lack of transparency, algorithmic bias, limited accountability, and insufficient explainability of AI-driven decisions, as well as need for protection of personal data, underscore the urgent need for a multi-layered institutional framework that safeguards the fundamental principles of the rule of law. Some countries, such as France, have already adopted strict regulations for data protection and to prevent the instrumentalization of judges.

At the level of the European Union, the adoption of the AI Act and the CEPEJ Ethical Charter reflect the effort to ensure a harmonized and safe design of AI in the field of justice, with a human-centered approach. Similar regulatory developments are observed globally, with the U.S., China, and the U.K. following different strategies, highlighting the geopolitical dimension of the issue.

Summarizing, based on our research we can propose the following recommendations

concerning the utilization of AI in justice:

- Institutional provision for the transparency, explainability and accountability of the algorithms we use in justice.
- Training of judicial and legal professionals in the use and oversight of AI tools.
- Adoption of ethical AI principles based on EU and Council of Europe standards.
- Development of low-risk tools that enhance efficiency without replacing human judgment.
- Strengthening interoperability of judicial databases and citizen access (e.g., through ODR solutions).

AI can become a valuable tool for enhancing justice, under the strict condition that it is integrated within a human-centered, institutionally safeguarded, and ethically responsible framework. The future of justice, though digital, must remain profoundly human-centric.

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