

The Artificial Intelligence Integration in the Brazilian Legal Sector: A Systematic Review

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Abstract

Context: The National Council of Justice (CNJ) reported 140 Artificial Intelligence (AI) projects in the Brazilian Judiciary by 2023, distributed across 62 courts, representing an increase of 26.13% over the previous year. This growth reflects a digital transformation in the legal sector, focusing on increasing productivity and reducing costs and procedural times. **Problem:** Despite the progress, there is still a gap in the systematic understanding of the IA implementations in the legal sector due to the lack of detailed documentation that compromises transparency and hinders the overall evaluation of the efficiency of these technologies. **Proposed Solution:** This study conducts a systematic review to map the current panorama of AI use in the Brazilian legal sector, identifying the types of projects implemented and their scientific and technical production characteristics. **IS Theory:** Based on the Diffusion of Innovations Theory, which analyzes how new technologies spread in social systems. **Methodology:** Following Kitchenham's systematic review methodology and the PRISMA guidelines, studies published between 2020 and 2024 were analyzed using academic databases and judicial platforms. **Summarization of Results:** 90 projects were identified in higher, regional, and state courts and other bodies. The main applications involve textual classification and task automation to optimize procedural efficiency. A lack of documentation and standardization was also identified, highlighting the need for more project transparency. **Contributions and Impact on IS:** The study maps the intersection between AI, Information Systems, and the legal sector in Brazil, highlighting topics that need more attention. It contributes to the advancement of adaptive IS architectures and provides a theoretical-empirical basis to drive the digital transformation of the judicial system.

CCS Concepts

• **Computing methodologies** → Artificial intelligence; • **Social and professional topics** → Computing / technology policy.

Keywords

Text Mining, Artificial Intelligence, Legal Domain, Public Sector, Natural Language Processing, Civil Law

1 Introduction

Artificial Intelligence (AI) has established itself as a disruptive technology in Brazilian public administration, redefining processes and

operational efficiency in the judicial system. This digital transformation is evidenced by the National Council of Justice (CNJ) 2023 report, which identified 140 AI projects distributed in 62 courts, representing a 26.13% increase over the previous year [9]. Its growth reflects a paradigm shift in justice provision, characterized by the automation of decision-making processes and optimization of judicial management, aimed at increasing productivity and reducing procedural times and costs [50].

The magnitude of this transformation is contextualized by data from the Regional Centre for Studies for the Development of the Information Society (Cetic.br) (2023)¹, which show the widespread computerization of the Brazilian public sector: 82% of federal and state public bodies already use Information Systems (IS) for management, especially the Public Prosecutor's Office (96%), the Judiciary (93%), and the Legislative Branch (92%), creating an environment conducive to implementing more advanced technologies[5].

The COVID-19 pandemic significantly accelerated this process, driving judicial services modernization to ensure the continuity provision during the period of social distancing [7, 11]. In parallel, the CNJ established Resolution No. 332/2020, which "disposes on ethics, transparency and governance in the production and use of AI in the Judiciary" [8], recognizing the role of AI in promoting the well-being of the jurisdictions and in the equitable judicial services provision. As a result of this regulation, the Justice 4.0 [10] program was established, an initiative that brings together the CNJ, the Programa das Nações Unidas para o Desenvolvimento (PNUD), and the Conselho da Justiça Federal (CJF).

Efforts to map and understand these innovations have been ongoing. Through annual reports by the Centro de Inovação, Administração e Pesquisa do Judiciário (CIAPJ) of the Fundação Getúlio Vargas (FGV) [52–54] and surveys by the CNJ [9]. Nevertheless, recent studies point to a significant lack of transparency in the mapping and documentation of these initiatives [58]. The diversity of approaches among courts and the lack of documentation standards make it difficult to assess these technologies' overall efficiency and compromise transparency and public access to information about these projects. It is crucial to highlight that AI applications in the legal sector vary significantly depending on legal traditions (common law vs. civil law) and regulatory frameworks (CNJ Resolution 332/2020) [32]. For this reason, comparing different AI applications across legal systems is not considered fair; thus, it is required to narrow the research scope rigorously.

¹<https://cetic.br/en/tics/governo/2023/orgaos/B4/>

To fill this research gap, we conducted a systematic literature review based on [27] guidelines and the Diffusion of Innovations Theory [18, 51]. This theory provides a *framework* to analyze how technological innovations are adopted in social systems, considering the five key elements of the diffusion process: i) the innovation itself, such as AI projects; ii) the communication channels published about these projects, especially those through partnerships between courts and institutions; iii) time, in this case the 2020-2024 evolution, considering the dynamism of technologies; iv) the social system - the context of the Brazilian judiciary; and the v) adoption characteristics. Therefore, the study is mainly aligned with two of the Grand Challenges for Information Systems Research in Brazil (2016-2026) [4], firstly the “Information Systems and the Open World Challenges” challenge, by exploring the importance of transparency and open data in the adoption of AI in the legal sector; and the “Information Systems Complexity” challenge, by addressing the interoperability and integration of judicial systems with AI technologies.

The remainder of this paper is organized as follows: in Section 2, related works are discussed; in Sections 3 and 4, the proposed methodology and the obtained results are described. Finally, in Sections 5 and 6, conclusions, limitations, and directions for future research are presented.

2 Related Works

The study by Zuiderwijk *et al.* [61] presents a systematic review to investigate the literature on the implications of using AI in public governance, also covering the opportunities and challenges, as well as proposing a future research agenda. The study's methodology followed the [27] guidelines/steps for systematic reviews: identification, selection, assessment of relevance and quality of studies, data extraction, and synthesis. The authors analyzed 26 papers, identifying nine benefits and eight challenges to implementing AI in public services, transportation, and public health. The results highlight the need for more empirical, multidisciplinary studies focused on specific forms of AI, as well as pointing out gaps related to transparency, regulation, and measuring the impact of AI. The authors suggest that AI practices in the public sector differ significantly from those in the private sector, requiring implementation strategies adapted to public value and governance needs.

Madan and Ashok [31] conducted a systematic review on the adoption and diffusion of AI in public administration, following the PRISMA guidelines, including: screening, data extraction, and quality assessment, prioritizing the inclusion of empirical research relevant to the application of AI in the public sector. From searches in three databases (EBSCO Host, SCOPUS, and Web of Science) and complemented by citations and Google Scholar, 73 studies were analyzed. Using the Technology-Organization-Environment (TOE) framework, the authors identified contextual factors for AI adoption, revealing that despite the benefits of automation and personalization, challenges persist regarding transparency, privacy, and institutional resistance. Another research finding is related to the lack of quantitative research with empirically tested conceptual models, especially on ethical issues and social impacts.

Almeida and Pinto [15] reviewed AI applications in the judiciary, focusing on efficiency and access to justice, analyzing 57 papers

from Web of Science, Scopus, and Capes databases. The study identified promising applications of AI in the global context, such as intelligent readers and legal search automation, as well as advances in algorithmic usage in Brazil, mainly in procedural screening and judicial precedents. However, the research has gaps, as it does not deal directly with the practical impacts of AI projects in Brazil, focusing on regulations and ethical principles. It does not address in more depth the tangible effects or results of these technologies in judicial proceedings.

Most studies that follow well-defined and replicable methodologies focus on broad public sector topics. In Brazil, recent surveys by public and private institutions, such as the CNJ [9], identified 140 AI projects in the Judiciary in 2023, emphasizing infrastructural and qualitative aspects. In parallel, the CIAPJ has published annual reports on the AI in Brazilian courts from 2020 to 2023 [52–54], mapping data as evaluation and monitoring methods. Nevertheless, these studies lack an in-depth analysis of the practical effects on judicial efficiency and an exploration of their documentation. This study sets itself apart by applying a complete systematic review approach to the Brazilian legal sector, aiming to quantify the impact of AI tools on reducing procedural time and optimizing judicial work, filling a gap in the existing literature by searching for aspects not previously measured, seeking quantitative and more technical analysis of AI applications.

3 Methodology

This study follows the guidelines proposed by Kitchenham and Charters [27] for systematic reviews in Software Engineering, adapted to the context of AI research in the legal sector. According to Grant and Booth [23], a systematic review is a method that seeks to systematically search, evaluate, and synthesize research evidence, following specific guidelines for its conduct, thus providing practical recommendations, identifying knowledge gaps, and proposing directions for future research. The present work follows the systematic review process, including: (i) Planning, (ii) Conduction, and (iii) Reporting; accordingly with other studies based on this methodology, such as Zuiderwijk *et al.* [61] and Leite *et al.* [30].

3.1 Planning

This first stage consisted of defining the Research Questions (RQs), information sources, search strategy, and selection criteria definition.

Research Questions. The study's main objective is to systematically identify and analyze the AI projects implemented in the Brazilian legal sector, focusing on these projects' current panorama and transparency. The following RQs were defined:

RQ1 How is the evolution and distribution of scientific production on AI projects in the Brazilian judiciary characterized?

RQ2 What are the main AI projects implemented in the Brazilian legal sector?

The RQs were defined with the support of experts in the field, guaranteeing their suitability for the evolution of scientific knowledge (RQ1) and the practical applications of AI in the judiciary (RQ2). While RQ1 analyzes scientific outputs, RQ2 maps practical implementations, allowing for an approach that integrates theoretical and empirical perspectives, bridging the gap between academic research and practical implementation.

Selection Criteria. At this stage, the selection criteria were defined, i.e., the studies excluded and included in the systematic review, as listed in Table 1. The IC and EC covered studies published in

Table 1: Inclusion and Exclusion Criteria for Studies

Inclusion Criteria (IC)
IC1: Studies published in the last 4 years (2020-2024) (considering the technology's dynamic nature);
IC2: Studies applied to the Brazilian context;
IC3: Studies addressing AI projects and tools in the legal sector;
IC4: Grey literature, such as technical reports, theses, and dissertations.
Exclusion Criteria (EC)
EC1: Opinion articles, editorials, and comments without empirical data;
EC2: Purely theoretical and conceptual studies.

the last 4 years, considering the dynamism of technologies (IC1) and focused on the Brazilian scenario and practical implementations (IC2, EC2), as AI applications in the legal sector vary significantly depending on legal traditions (common law vs. civil law) and regulatory frameworks (CNJ Resolution 332/2020) [32]. Given the impact of AI applications varying across legal systems, we prioritized empirical studies to assess practical implementations.

The papers obtained in the search stage were read in the following order: (i) title, abstract, and keywords; (ii) introduction and conclusion; and (iii) full paper. These phases were applied according to the selection criteria.

Information Sources and Search Strategy. Academic databases and specialized platforms in the legal sector were used to identify the relevant studies for this systematic review. *Google Scholar* was selected as the main academic source due to its wide reach and ability to index different types of publications. In addition, official judicial platforms were consulted, including the CNJ² portal and FGV³, which maintain specific repositories on technological innovations in the Brazilian judiciary. These databases allowed access to technical reports, institutional documents, and domain-specific literature, often unavailable in other databases (which were tested for the review).

The search strategy was developed based on the RQs and refined through pilot tests, including synonyms, abbreviations, and alternative spellings of the relevant terms [27]. The final search text was structured by combining terms related to technology, legal context and geographical location: (“*Inteligência artificial*”) AND (“*jurídico*” OR “*judiciário*” OR “*direito*” OR “*tribunais*”) AND (“*brasil*” OR “*brasileiro*” OR “*português*” OR “*nacional*”) AND (“*público*” OR “*privado*”) AND (“*Processamento de linguagem natural*” OR “*Natural language processing*” OR “*NLP*” OR “*PLN*”) AND (“*Métricas*” OR “*desempenho*”). The search string was designed to align with the study’s objectives, focusing on AI applications in the Brazilian legal sector, particularly NLP, given its predominance in judicial AI projects [9]. In addition to validating the research questions, the domain experts also validated the search string.

Data Extraction Items. To ensure a systematic and comprehensive collection of relevant information to meet the RQs, specific items were defined for extraction and organized into five main categories, as shown in Table 2.

The selection of these items was guided by the study’s RQs, objectives, and the Diffusion of Innovations Theory [51]. Bibliographic data maps the topic’s academic evolution and communication channels; institutional information clarifies organizational and collaborative project contexts; technical and performance data evaluates methods and results; and additional details address implementation maturity and availability.

3.2 Conduction

This systematic review strictly followed the protocol defined in the planning stage, as presented in the previous section. To ensure transparency and reproducibility of the research process, the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) [39] flow chart was adopted, which is considered the gold standard for reporting systematic reviews as adopted by Leite *et al.* [30], Zuiderwijk *et al.* [61] and Sundermann *et al.* [57]. Fig. 1 shows the flow of information through the review phases, mapping the studies number identified, included, and excluded at each stage.

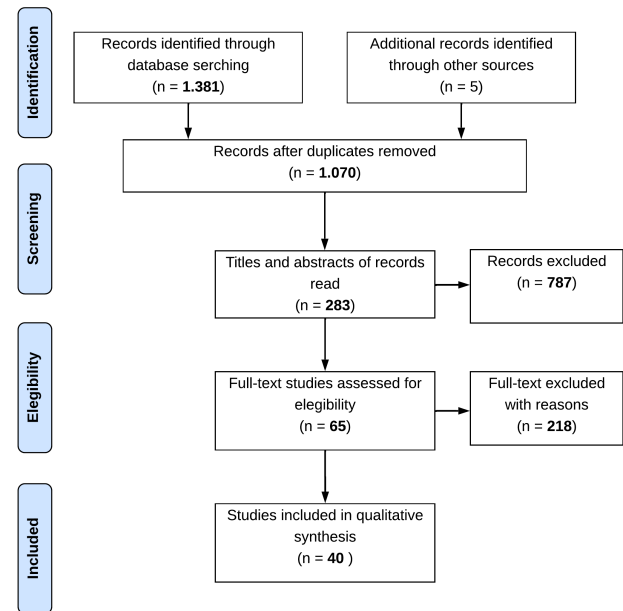


Figure 1: PRISMA Flow Diagram

In the initial identification phase, studies were collected using the *Harzing’s Publish or Perish*⁴ tool, which made it possible to systematically extract metadata from *Google Scholar* publications. The searches took place between 2020 and 2024, resulting in 1,381 initial database records, as well as the inclusion of 5 reports (three from FGV, one from TCU, and one from CNJ), which were stored in Comma-Separated Values (CSV) format for further processing. In addition, technical documents and reports were collected from the CNJ and FGV platforms, enriching the dataset with relevant gray literature. In the screening phase, the records were imported into the Rayyan⁵ platform, which specializes in systematic reviews, helping to detect duplicates automatically. This enabled 316 duplicate studies to be identified and removed, resulting in 1,070 unique

²<https://bibliotecadigital.cnj.jus.br/>

³<https://repositorio.fgv.br/>

⁴<https://harzing.com/resources/publish-or-perish>

⁵<https://www.rayyan.ai/>

Table 2: Overview of Information Collected from Selected Studies

Category	Metadata	Description
Descriptive Information	Complete reference	Complete reference including authors, year, title, and other details
	Year	Year of study publication
	Publication type	Type of publication (e.g., Research papers, technical report, thesis, dissertation)
	Research Methods	Study methodology (e.g., case analysis, literature review, report)
	Source info	Source of the study (e.g., journals, conferences, institutional reports)
Institutional Data	Publication entity	Entity or organization responsible for the publication
	Institution	Organization or court responsible for the project
	Partnerships	Institutional and collaborative partnerships
Technical Aspects	Implementation year	Year the project was implemented
	Project name	Name of the AI tool or project (Projects without a name were defined as “unnamed”)
	Training data	Characteristics and sources of the training dataset
	Task type	Type of automated task (e.g., classification, prediction, and text analysis)
	AI approach	Type of AI approach used (e.g., Machine Learning (ML), Deep Learning (DL), NLP)
Performance Analysis	Methodology	Project methodology
	Metrics	Evaluation metrics used e.g., (accuracy, F1-score etc)
Access and Links	Results	Reported outcomes and impacts achieved (efficiency improvement, time reduction)
	Access	URL or access method to the project or study
	Documentation	Description documentation additional

records for analysis. Next, two independent researchers performed the initial screening based on titles, abstracts, and keywords, applying the inclusion and exclusion criteria defined in Table 1. At this stage, 787 studies were excluded because they did not meet the established criteria, mainly because they did not specifically address AI implementations in the Brazilian legal context or were purely theoretical.

The remaining 283 studies proceeded to the complete reading phase and quality assessment, where they were analyzed for relevance and methodological rigor. Two independent reviewers conducted this assessment using a quantitative scale of 4 to 12 points, considering four main dimensions: methodological clarity, validity of the projects, representativeness of the data, and transparency in presenting results. Each dimension was scored as high (3), moderate (2), or low (1), and only studies with a total score of 8 or more were retained, resulting in the final selection of 40 studies.

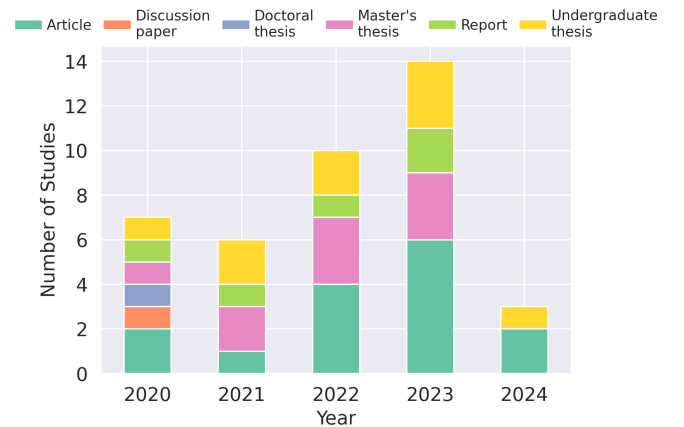
Mendeley bibliographic management software was used to organize the studies systematically, and their respective metadata was recorded in a structured spreadsheet as shown in Table 2. With the metadata extracted, an exploratory analysis was carried out using Python, where the *pandas* and *matplotlib* libraries were used to visualize patterns in the studies. Topic modeling was used to identify the main topics present in the studies. We employed the BERTopic [24] technique with the sentence-transformers language model adapted for Portuguese in the legal domain⁶, applied to texts previously processed using tokenization, stopword removal, and lemmatization techniques.

4 Results and Discussion

This section discusses the systematic review results according to the RQs established. The analysis is based on 40 selected studies, highlighting the progress and implementation of AI projects in the Brazilian Judiciary.

4.1 Overview of Scientific Production on AI in the Brazilian Judiciary (RQ1)

The temporal evolution, typologies, and methodologies of publications were analyzed to understand how the scientific and technical community has approached AI in the Brazilian judiciary. This analysis is particularly relevant given the rapid technological evolution and recent regulatory changes in the sector [5]. The temporal distribution and publications typology on AI in the Brazilian judiciary are shown in Fig. 2.

**Figure 2: Publication Types by Year.**

The analysis of Fig. 2 reveals a growth in production between 2020-2023, peaking in 2023 with 14 publications, mainly research papers (43%), followed by master's dissertations (25%), technical reports (15%), course completion papers (12%) and doctoral theses (5%). These results coincide with important milestones such as CNJ Resolution No. 332/2020 and the Justice 4.0 program, which have stimulated AI research and implementation in the Brazilian judiciary [8, 11]. The distribution of research methods was analyzed to

⁶<https://huggingface.co/rufimelo/Legal-BERTimbau-sts-base-ma-v2>

understand the methodological approaches used in these studies and their alignment with the sector's practical needs. It was observed that there is a predominance of case studies (55%), followed by bibliographical analyses (30%) and technical reports (15%), where this distribution reflects the practical-applied nature of works in the area, with a focus on real implementations. It is important to note that the case studies analyzed constitute the main source of detailed technical documentation on AI projects and are the only ones that present complete empirical data on implementation, methodology, and results. Among the 22 case studies analyzed, the following stand out:

Document Classification and Analysis Projects.

- The Athos project, documented in a master's dissertation by Universidade de Brasília (UnB) [21], was developed at the Superior Tribunal de Justiça (STJ) in partnership with various organizations (Secretaria Judiciária, Núcleo de Gerenciamento de Precedentes e de Ações Coletivas (NUGEPNAC), Secretaria de Tecnologia da Informação (STI)). It used a corpus of 328,732 documents and a dictionary of 49,165 words, applying PLN, ML, and Doc2Vec techniques. Following the Cross Industry Standard Process for Data Mining (CRISP-DM) methodology, it achieved 90% accuracy and reduced Recursos Especiais by 8.7% between 2019-2021.
- The Toth system, presented in an article in Revista Eletrônica do CNJ [35], was developed by Tribunal de Justiça do Distrito Federal e Territórios (TJDFT) using procedural data from Processo Judicial Eletrônico (PJe) and technologies such as fastText and Optical Character Recognition (OCR), achieving 81% precision in process class classification.
- The RAFA 2030 project, documented in an article in Revista da Controladoria-Geral da União (CGU) [22], was implemented at Supremo Tribunal Federal (STF) using various techniques (e.g., Bidirectional Encoder Representations from Transformers (BERT), Support Vector Machine (SVM), Naive Bayes, XGBoost) to classify cases according to Objetivos de Desenvolvimento Sustentável (ODS), achieving accuracies between 77.5% and 93.7%.
- The CICIAR project, presented in a master's dissertation from Coordenação dos Programas de Pós-Graduação de Engenharia at Universidade Federal do Rio de Janeiro (COPPE/UFRJ) [38] and in the article by [48], was implemented at Defensoria Pública do Rio de Janeiro (DPRJ) in partnership with UFRJ and Pontifícia Universidade Católica do Rio de Janeiro (PUC-Rio), processing 57,397 cases and 214,000 summonses using BERT transformers, achieving 83% accuracy.
- The CDJUR-BR project, reported in a scientific article [33], represents a collaboration between Tribunal de Justiça do Ceará (TJCE), Ministério Público do Estado do Ceará (MPCE), and Universidade de Fortaleza (Unifor), creating an annotated dataset of legal documents for Named Entity Recognition model training.

Clustering and Preventive Analysis Projects.

- The Kairos project, documented in an undergraduate thesis from UnB [1], was developed in partnership with Centro de Excelência em Inteligência Artificial at Universidade Federal de Goiás (CEIA/UFG), CNJ, and Programa das Nações Unidas

para o Desenvolvimento (PNUD), using a gold-standard dataset of 317 cases and techniques such as SPECTER RoBERTa Jurídico, achieving the goal of clustering similar cases with 77.79% accuracy.

- The Alice system, documented in a dissertation from Instituto Brasileiro de Ensino, Desenvolvimento e Pesquisa (IDP) [37], Fundação Getúlio Vargas (FGV) [41], and UnB [47], was developed by CGU in collaboration with Tribunal de Contas da União (TCU), analyzing procurement bids and auction minutes from the government procurement portal (ComprasNet) and Diário Oficial da União (DOU), generating significant savings through preventive audits, such as protecting R\$ 291,361,573.98 in potentially irregular expenses between 2017-2020.
- An unnamed project at TCU, reported in an undergraduate thesis also from UnB [26], selects acts with the highest likelihood of being illegal for manual analysis, examining 375,608 personnel acts using eXtreme Gradient Boosting (XGBoost) and Grid Search Cross-Validation (GridSearch CV), achieving 97% accuracy.

In addition, other studies were identified that, although without a specific project name, made significant contributions in different areas, such as predictive analysis in conciliations with MCC of 0.3285 using ULMFiT Bidirectional [45]; classification of labor cases achieving 83% accuracy with SVM [2]; text classification using Legal Embeddings with 76% accuracy [19]; classification of irregularities with an F1-Score of 96% [12]; and classification of accountability cases [3] achieving an F1-Score of 98.99% using XLM-RoBERTa.

The analyzed publications show frequent collaboration among institutions, resulting in multiple affiliations per publication. Considering these collaborations, academic institutions lead with participation in 51.8% of the studies, followed by journals and events (24.1%), judicial and government bodies (16.7%), and other institutions (7.4%). Among academic institutions, UnB stands out with participation in 8 studies, followed by FGV with five and Universidade Federal do Rio Grande do Norte (UFRN) with four participations. This distribution highlights the central role of public universities in AI research in the Brazilian judiciary, with a strong trend toward interinstitutional collaboration. It is observed that many publications result from partnerships among multiple institutions, as exemplified by collaborations among universities and events, such as the Encontro Nacional de Inteligência Artificial e Computacional (ENIAC), UFRN, and Universidade Federal do Pará (UFPA), as well as joint publications by different universities, such as Universidade de São Paulo (USP), Universidade Estadual de Ponta Grossa (UEPG), and Pontifícia Universidade Católica do Paraná (PUCPR).

4.2 AI Projects in the Judiciary (RQ2)

Identifying and analyzing AI projects implemented in the Brazilian judiciary is imperative to understanding how the technology is applied and what results are achieved. Data analysis revealed 112 AI projects, of which 90 have a defined name, and 22 were classified as "unnamed". These 90 named projects are distributed among the different levels of the Brazilian judiciary and are presented in Table 3. The concentration of initiatives varies significantly, as illustrated in Fig. 3.

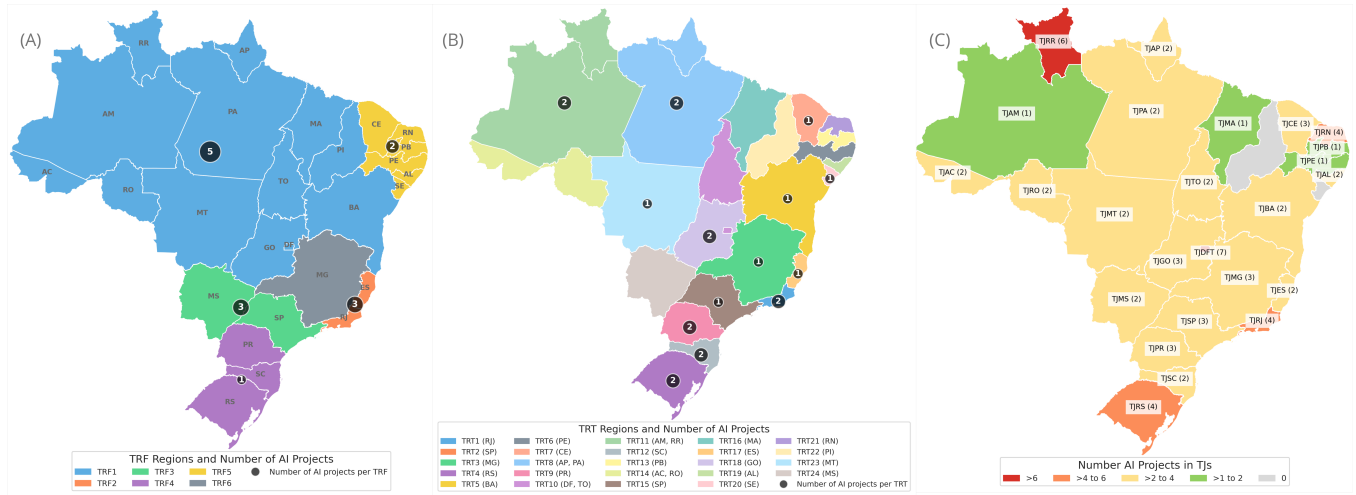


Figure 3: Distribution of AI projects in the Brazilian judicial system. (A) Federal Regional Courts; (B) Regional Labor Courts; (C) State Courts of Justice, categorized by AI projects.

The Superior Courts and Councils (11 projects, including four unnamed projects): STJ: 6 projects, including Athos, which, according to [21], works with a corpus of 328,732 documents and a dictionary of 49,165 unique words, achieving 90% accuracy in clustering for identifying qualified precedents; STF: 2 projects, notably Victor, which, as reported by [20], achieved 95.07% accuracy in separating case components and 94.13% in classification, using procedural data from 2017-2018; CNJ: 2 projects, including Sinapses, which, according to [53], processes over 3 million judicial documents; Tribunal Superior do Trabalho (TST): 1 project (Bem-te-vi). The other project distributions can be seen in Table 3.

Among the **Federal Regional Courts (TRFs)**, which collectively account for 14 AI projects (4 unnamed projects), TRF1, TRF2, and TRF3 have the most initiatives, including SIGMA (TRF3), which achieved significant efficiency improvements in backlog reduction [53]. The **Regional Labor Courts (TRTs)** account for 21 AI projects (3 unnamed projects), with TRT12, TRT11, and TRT4 being notable contributors. Highlighting the Gemini project, implemented across multiple TRTs, which, as reported by [40], uses a case database with content similarity to assist in drafting opinions for appeals. **State Courts (TJs)** collectively implement the majority of AI projects (66 in total, including 13 unnamed projects), with TJDFT, TJRR, and TJRN leading in innovation. Among these, Amon (TJDFT) employs facial recognition with a response time of under 10 seconds, while ELIS (TJPE) reduced tax execution analysis time from 1.5 years to just 15 days [16, 54]. Another notable case is the Victoria system from TJRJ, which, according to [49] and [29], achieved 99.95% accuracy in automating blockages and transfers, reducing the processing time from 2.5 years to 3 days.

This distribution demonstrates a concentration of projects in larger courts and the South and Southeast regions, although significant initiatives exist in all regions of the country. As pointed out by [6], this disparity may be related to differing levels of technological infrastructure and investment capacity among courts. The project's technical analysis reveals a predominance of approaches based on

ML and PLN. More recent projects, such as SAVIA from TJMG, are beginning to incorporate LLMs such as Generative Pre-trained Transformer 3.5, indicating an evolution in the technical capabilities implemented [40]. The reported performance metrics are generally high, with several projects achieving accuracy above 90%.

This characterization shows a scenario of significant evolution in the adoption of AI by the Brazilian judiciary, with significant results in terms of procedural efficiency. However, as pointed out by [6], there are still significant challenges related to the standardization of methodologies and transparency in project documentation, which need to be addressed to ensure the sustainability and scalability of these initiatives. The CNJ's use of technologies such as *Sinapses*, which centralizes and audits AI models on a national platform, is an example of a practice that seeks to guarantee the integrity and supervision of automated systems [40].

4.3 Discussion

Analysis of the results reveals a diverse panorama of AI projects applied to the Brazilian judicial system, highlighting different technical approaches and levels of transparency in documentation and implementation. Topic modeling made it possible to identify and categorize the main emerging themes in the literature, aligned with the "OECD Framework for the Classification of AI Systems" [43], as represented in Fig. 4. The Sankey diagram reveals three major thematic clusters that converge on specific areas of application: (1) technical and computational aspects that target legal operations (AI in Legal Operations); (2) AI and machine learning that permeate multiple applications; and (3) procedural systems that converge on technical solutions (AI in Technical Solutions).

The quantitative analysis of the topics reveals the predominance of technical and operational terms, aligning with the OECD principles on Trustworthy AI [42], particularly concerning transparency, explainability, and technical robustness. This categorization not only organizes the understanding of Brazilian initiatives but also positions them within the context of international best practices,

Table 3: AI projects in Brazilian judicial and administrative institutions, grouped by institution with study references

Institution	Projects	References
Superior Courts and Councils		
STF	Victor	[6, 13, 14, 16, 20, 28, 29, 34, 40, 46, 49, 52–55]
	Rafa 2030	[22, 54, 55]
	Athos	[6, 21, 29, 49, 52–55]
STJ	Sócrates	[6, 13, 14, 16, 28, 29, 49, 52, 55]
	E-Juris, TUA	[29, 52]
	Datajud	[54]
Federal Regional Courts (TRFs)		
	Alei (TRF1)	[13, 52–54]
	27a vara federal (TRF2)	[17]
	Execução Célere, Secor, Banco de Sentenças (TRF1), Atendente Virtual (TRF2)	[52]
	Sigma (TRF3)	[25, 29, 53, 59]
	Sinara (TRF3)	[29, 52, 59]
	IANA (TRF5)	[13]
	Julia (TRF5)	[29, 52]
Regional Labor Courts (TRTs)		
	Bem-te-vi (TST)	[6, 13, 14, 29, 52–54, 59]
	B.I. TRT11	[29, 52]
	Concilia JT (TRT12)	[13, 29, 52, 53]
	Gemini (TRT5, TRT7, TRT8, TRT15, TRT17, TRT20)	[13, 29, 40, 52, 53, 59]
	IA para Conciliações (TRT1)	[52]
	LIA (TRT12)	[13]
	ICIA (TRT4), Seguro Garantia, Magus (TRT9), Sistema de Busca Patrimonial (TRT18), Sistema de Jurisprudência (TRT23), Hórus (TRT11, TRT18), Data Lake (TRT3)	[53]
State Courts of Justice (TJs)		
TJDFT	Amon	[13, 29, 52–55]
	Artiu	[29, 54]
	Canal Conciliar	[13]
	Hórus	[13, 14, 29, 52–54]
	Natureza Conciliação	[29]
	Saref	[29, 53, 54]
TJRN	Toth	[13, 29, 35, 53, 54]
	Clara	[13, 28, 29, 49]
	GPSMed	[53]
	Jerimum	[13, 28, 29, 49]
	Poti	[6, 13, 28, 29, 49]
	Chatbot, Giulia, Sije	[13]
TJRR	Mandamus	[13, 28, 29, 52, 55]
	Scriba	[13, 29, 52]
	Saref	[29, 53, 54]
	Elis (TJPE)	[6, 13, 14, 16, 28, 29, 40, 49, 52, 53, 55]
	LEIA (TJAC, TJAL, TJAM, TJCE, TJMS, TJSP)	[13, 14, 29, 36, 52, 53, 55]
	Sinapses (TJRO, CNJ)	[13, 16, 28, 29, 40, 49, 52, 53]
Other TJs	Hércules (TJAL)	[13, 29, 52, 53, 55]
	Judi (TJSP)	[52, 53]
	Berna (TJGO, TJPA)	[13, 29]
	Tucujuris (TJAP), Agil (TJMG)	[14, 29]
	Victoria (TJRJ)	[29, 49]
	CDJUR-BR (TJCE)	[33]
	Projeto 1 (TJES), Queixa Cidadã (TJBA), IA332 (TJGO), Minerjus (TJTO)	[52]
	Argos (TJES), Argus (TJRS), Jurimetria com IA (TJMS), Jurisprudência IA (TJSC), Mí-das (TJPB), ODR (TJRJ), Omni (TJMT), Peticionamento Inteligente (TJRO), Programa Cientista Chefe (TJCE), TIA (TJAP)	[53]
	Eproc (TJRS), PIAA (TJPR)	[13]
	Execuções Fiscais (TJRJ, TJRS)	[28], [40]
	Larry (TJPR)	[53], [29]
	Radar (TJMG)	[6, 13, 14, 16, 28, 29, 49, 55]
	Savia (TJMG)	[40, 49]
TCU	Alice (CGU)	[6, 25, 37, 41, 47]
	Adele, Agata, Carina, FCB	[25]
	Assistente Conjur	[59]
	Monica, Sofia	[6, 25]
	Zello	[25, 59]
Other Institutions	Ciciar (DPRJ)	[38, 48]
	Classificador IA-PGD (PGDF)	[56]
	Corpus 927 (ENFAM), Rybena (TRE-MT)	[13]
	Kairos (CEIA/UFG)	[1]
	TCMRIO-Assistente (TCMRIO)	[44]

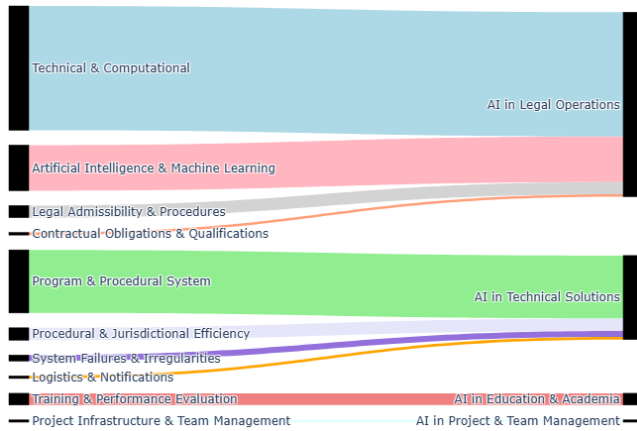


Figure 4: Summary of the extracted topics and emerging themes.

reflecting the influence of the OECD framework on the Brazilian Artificial Intelligence Strategy (EBIA) and Resolution 332/2020 of the CNJ [8]. Emerging topics show that the predominant focus of AI projects is on initiatives aimed at Technical & Computational and Program & Procedural System, which converge to AI in Legal Operations and AI in Technical Solutions, indicating a concentrated effort on automating repetitive tasks and standardizing judicial procedures. Projects such as *Victor* and *Athos* exemplify this trend, employing advanced machine learning techniques to automate critical stages of the legal process and enhance productivity [20, 21].

Diversity of Applications and Technical Approaches. The Artificial Intelligence & Machine Learning cluster spans different applications, highlighting the importance of NLP and learning techniques in analyzing large volumes of legal documents and process triage, as observed in initiatives such as *Elis* from TJPE. These projects have positively impacted processing time, aligning to optimize court workloads and decreasing procedural delays [16]. The topic of System Failures & Irregularities highlighted critical aspects faced by AI systems, such as inconsistencies in results, which can negatively impact the reliability of such systems [1]. This category, along with Logistics & Notifications, reinforces the need for a cautious approach in implementing AI to avoid biased or non-transparent results. These implementation challenges directly relate to the “Information Systems Complexity” challenge [4], as courts develop AI solutions with diverse and often incompatible architectures. Most projects function as isolated tools rather than integrated components of a cohesive judicial ecosystem, creating significant interoperability barriers [60].

Transparency and Documentation. The issue of transparency is related to Project Infrastructure & Team Management, which converges to AI in Project & Team Management. While initiatives such as *Sinapses* from CNJ promote a centralized model for auditing and control, ensuring stricter oversight and greater public access, many other projects still lack complete and standardized documentation [40]. The lack of technical detailing and performance reports undermines comparative evaluation among courts and limits the replicability of best practices. This documentation gap directly impacts the “Information Systems and the Open World Challenges”

[4], as transparency in AI judicial systems requires not only disclosing algorithms but also establishing standardized documentation frameworks. As highlighted by [6], comprehensive technical documentation and clear communication of methodologies are essential for transparency and public trust in automated judicial systems.

Impacts on Judicial Practice. The results indicate that AI projects in Brazil are implemented with a strong emphasis on Procedural & Jurisdictional Efficiency, a theme that emerges as one of the main topics. This aligns with the judiciary’s goal of reducing workload and improving procedural speed. However, challenges related to Legal Admissibility & Procedures and Contractual Obligations & Qualifications still need to be addressed to ensure the reliability and acceptance of these technological solutions. The topic of Training & Performance Evaluation, which converges to AI in Education & Academia, suggests growth opportunities in areas such as professional training and collaborative development between legal and academic institutions. Projects involving partnerships with universities, such as those mentioned by FGV, may contribute to a more integrated technological innovation ecosystem [53].

5 Threats to Research Validity

Like all scientific work, this systematic review has methodological limitations that must be acknowledged. The main threat to validity is related to identifying and selecting studies since the search string may not have captured all the relevant terms for identifying AI projects in the Brazilian judiciary, despite iterative refinement and the inclusion of synonyms. Another limitation concerns the search string, which prioritized NLP applications due to their predominance in judicial AI projects, as indicated by official reports [9]. Although other AI techniques, such as image recognition, are increasingly adopted, they were not explicitly included in this review. Technical reports and grey literature were incorporated to mitigate this limitation. Moreover, two independent researchers were used in the selection and classification process, with explicit inclusion and exclusion criteria and a standardized quantitative scale for assessing the quality of the studies.

The time frame of 2020-2024, although justified by the dynamics of the field and the publication of CNJ Resolution 332/2020 [8], represents another significant limitation, as it may have excluded pioneering projects that are relevant to understanding the evolution of AI in the Brazilian judiciary. The heterogeneity of the courts and their different technological capabilities can also affect the representativeness of the results, as can the lack of standardization in the technical documentation of the projects and the variability in the performance metrics used, which make direct comparisons between the initiatives analyzed difficult.

Strategies were adopted to minimize these threats, such as triangulating data between different sources when available, using appropriate NLP techniques to analyze the data, and documenting the limitations found. In addition, it sought to include various projects and contexts within the Brazilian judiciary, considering different levels of technological maturity in the analysis.

6 Conclusion

Unquestionably, AI is revolutionizing public administration, especially concerning the judicial systems. Despite many efforts to map

and understand the ongoing innovations, there is a research gap, considering the diversity of approaches among courts and the lack of documentation that compromises transparency and public access to information about AI in the judiciary system. To fill this gap, we conducted a systematic review that allowed us to identify AI projects in the Brazilian judiciary, which mainly focused on document classification and triage and the automation of repetitive tasks. At a higher level, it was observed where researchers are concentrating their efforts and how institutions are collaborating to develop these solutions. We analyzed 40 studies published in the legal domain, presenting the most prevalent AI techniques, their motivations, where they were applied, and, more technically, which methodologies and metrics were employed. Broadly, our results demonstrate how courts are evolving in adopting AI and introducing this technology on a large scale. There is a direct link between judicial requirements and AI, such as procedural efficiency, transparency, and reliability, to ensure the rule of law.

The analysis revealed significant publication growth and collaboration between academic institutions (51.8%) and judicial bodies, with promising results like *Victor* (95.07% accuracy) and *ELIS* (reducing analysis time from 1.5 years to 15 days). There is still a long way to go to consolidate AI in the judiciary and explore many opportunities. According to this systematic review, there are opportunities to expand research into case studies and frameworks that make AI adoption easier to develop and integrate with legacy systems. On the other hand, the lack of standardization in technical documentation emerged as a significant limitation, as observed in the heterogeneity of implementation reports.

Thus, this study directly contributes to the Grand Challenges of Research in Information Systems in Brazil (2016-2026) [4] related to “Information Systems based on (Linked) Open Data: From Openness to Innovation” and “Transparency in Information Systems,” by exploring the importance of transparency and open data in AI adoption in the legal sector; and to the challenge of “Full Interoperability: Challenges and Opportunities for Future Information Systems,” by addressing the interoperability and integration of judicial systems with AI technologies. The results demonstrate that the AI field in the judiciary needs to focus more on implementation standardization and documentation rather than merely creating new isolated solutions. Implementation quality assessment should also include standardized metrics to compare different use cases and methods.

Although significant, the limitations identified in this study, such as the temporal scope (2020-2024) and the diversity in project documentation, do not entirely compromise the results. At the very least, it is hoped to have introduced fundamental concepts, covered substantial areas of the field, and shown how they relate to each other and what challenges still need to be addressed. For future work, plans include conducting international benchmarking and incorporating English search terms. We also intend to develop a framework or architectural guidelines for applying AI in the judiciary and create a guide considering technical and organizational aspects. This architecture should be generic and flexible, addressing the previously discussed challenges of documentation, standardization, and integration.

Finally, this study can serve as a starting point for other researchers in the field and help fill some of the gaps identified in

the implementation of AI in the Brazilian judiciary. The analysis provides a solid foundation for developing solutions in the legal domain and standardized approaches, contributing to the evolution of Information Systems in the public sector.

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