



Artificial Intelligence in the Administration of Justice: Pathways, Promises, and Challenges

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DOI: <https://doi.org/10.5281/zenodo.23016350>

Abstract

Digital transformation has opened new possibilities for modernising justice systems, with artificial intelligence emerging as one of the most consequential and complex forces shaping this evolution. AI-driven tools are being deployed across jurisdictions to support legal research, automate documentation, manage caseloads, and facilitate virtual court proceedings, functioning as aids to human judgment rather than substitutes for it. Notable implementations range from case classification systems in France and Brazil's VICTOR platform, to India's comprehensive e-Courts initiative, which encompasses automated case handling, multilingual translation through SUVAS, and AI-assisted legal research via SUPACE. At the international level, UNESCO-led capacity-building efforts have extended judicial training across Latin America and Africa, reinforcing the OECD Recommendation on Access to Justice. Despite these advances, the integration of AI raises substantive concerns: algorithmic bias arising from historically skewed datasets, transparency deficits from opaque black-box models, and the erosion of judicial legitimacy. This paper examines the dual character of AI in the administration of justice its demonstrated potential alongside the ethical, legal, and data-related challenges it introduces and argues that responsible integration requires coordinated policy reform, robust judicial education, and governance frameworks that ensure AI serves as an instrument of justice rather than a source of inequity.

Manuscript Information

- **ISSN No:** 3139-9851
- **Received:** 23-07-2026
- **Accepted:** 20-08-2026
- **Published:** 28-09-2026
- **IJCATM:** 1(3); 2026: 13-19
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- **Plagiarism Checked:** Yes
- **Peer Review Process:** Yes
- **Paper type:** Review Paper

How to Cite

Ramalingam AV. Artificial intelligence in the administration of justice: pathways, promises, and challenges.. Int. J. Current Acad. Trend. Multi. 2026;1(3): 13-19

Access this Article Online



www.ijcatmjournals.com

KEYWORDS: Artificial Intelligence, Administration of Justice, Algorithmic Bias, Access to Justice, Judicial Governance.

1. INTRODUCTION

The administration of justice, traditionally grounded in human deliberation and centuries-old legal principles, is experiencing a transformative shift driven by digital technologies. Artificial intelligence (AI) is rapidly reshaping how legal systems operate, how justice is accessed, and how judicial decisions are supported. AI-driven tools are actively deployed across jurisdictions to support legal research, automate documentation, manage caseloads, classify cases, and facilitate virtual court proceedings functioning as augmentation tools rather than replacements for human judges^[1]

The emergence of AI in judicial contexts is characterised by a striking duality. On one side lies considerable promise: AI can reduce case backlogs, accelerate decision-making, lower operational costs, and extend access to justice to marginalised populations. India's e-Courts initiative, Brazil's VICTOR platform, France's case classification systems, and UNESCO-led capacity-building efforts exemplify global momentum.^[2] On the other side lie substantial risks: algorithmic systems trained on historically skewed data may reproduce existing biases in high-stakes applications such as predictive policing and recidivism assessment, while the opacity of AI systems raises critical questions about transparency, accountability, and judicial legitimacy.^[3]

This study examines three interconnected dimensions: (i) pathways through which AI is incorporated into judicial systems; (ii) the promises AI holds for operational efficiency and access to justice; and (iii) the ethical, legal, and data-related challenges it introduces. The scope is limited to civil and criminal judicial systems and does not extend to private arbitration unless it intersects with public judicial processes.

2. Historical Context and Conceptual Framework

Court digitisation traces back to the 1980s when personal computers first appeared in legal offices. Legal research platforms such as Westlaw and LexisNexis began incorporating AI components as early as 2003, using machine learning to better understand researchers' queries.^[4] These early innovations laid the groundwork for more sophisticated applications but remained largely administrative rather than decisional.

The COVID-19 pandemic served as a watershed moment. Between 2020 and 2021, the World Bank monitored 120 economies and found that 77 out of 120 introduced additional electronic features in 2021 alone. Within two years, 65 jurisdictions enabled remote hearings and 41 introduced electronic filing.^[5] This acceleration widened the digital divide: 88% of high-income economies introduced additional electronic features by 2021, compared to only 17% of low-income economies.^[6]

Conceptually, three distinct phenomena require precise definition. Artificial Intelligence (AI) refers to machine-based systems that, for a given set of human-defined objectives, make predictions, recommendations, or decisions influencing real or virtual environments. Machine Learning (ML), a subset of AI, enables programs to learn from experience and improve performance without being explicitly programmed. Automation in courts refers to technology handling repetitive processes with

minimal human intervention, categorised across three dimensions: no human involvement, human-on-the-loop, or human-out-of-the-loop systems.^[7] The critical distinction between automation (adjunct to human reasoning) and autonomy (computer-based legal reasoning unaided by humans) remains central to current best practice, which envisions AI as assistive, not substitutive, of judicial reasoning.^[8]

3. Typology of AI Applications and National Implementations

AI applications in judicial systems crystallise into five primary categories, each serving different functions along the spectrum from administrative support to decision assistance.^[9]

3.1 Case Management and Legal Research

Case management systems represent the most widely adopted AI applications globally, automating case classification, docketing, scheduling, and workload distribution. Brazil's SIGMA system analyses stored texts and compares them with procedural documents to suggest templates for drafting judgments. Egypt's AI transcription tools have automated court transcripts, significantly reducing manual effort. China's Smart Courts project deployed optical character recognition, automatic speech recognition, and natural language processing to reduce average trial times by 30%.^[10] Legal research tools leverage machine learning to assist judges in navigating vast volumes of case law. India's SUPACE understands the factual matrix of cases with intelligent precedent search, while Argentina's Prometea virtual assistant helped legal professionals process nearly 490 cases per month compared to 130 before a 300% productivity increase.^[11]

3.2 Sentencing Tools, E-Filing, and Virtual Hearings

Sentencing and risk assessment tools represent the most controversial category due to their high-stakes implications. The COMPAS system predicts recidivism risk across multiple U.S. states, while China's Shanghai 206 AI System assists with evidence evaluation and sentencing requirements.^[12] E-filing platforms have evolved to include automated defect identification and metadata extraction, while virtual hearing infrastructure given unprecedented urgency by the pandemic has become permanent in many jurisdictions, with India's Nyaya Shruti app facilitating virtual appearances.^[13]

3.3 Comparative National Implementations

France has deployed case classification and predictive analytics systems, with the 2016 Digital Republic Law requiring public disclosure of administrative algorithms. Brazil's VICTOR system, developed with the University of Brasília, classifies documents in approximately four seconds with 94.13% accuracy, compared to 44 minutes required by court employees.^[14] Beyond VICTOR, Brazil has deployed 140 AI systems across 62 courts, though over 65% of AI projects were discontinued by 2023, highlighting sustainability challenges.^[15] India's SUVAS employs neural machine translation to convert judgments into nine vernacular languages, addressing barriers in a linguistically diverse nation. China's National Judicial AI

Platform, built on data from millions of cases, integrated optical character recognition and speech recognition across the entire apparatus—reducing trial times by 30% though China's implementation raises concerns about transparency and integration with broader surveillance infrastructure.^[16]

4. International Initiatives and Access to Justice

UNESCO has trained more than 11,000 judges, prosecutors, and court staff through sessions across 160 countries since 2022.^[17] Its flagship AI, Justice, and the Rule of Law MOOC, developed with Oxford's Saïd Business School, supports judges in assessing AI through a human rights lens.^[18] In February 2026, UNESCO launched AI Essentials for Judges alongside its Guidelines for the Use of AI Systems in Courts and Tribunals, establishing norms for human oversight, transparency, and accountability.^[19] The OECD's Recommendation on Access to Justice and People-Centred Justice Systems (2023) articulates principles for digital technologies to support justice efficiency and fairness, while the Council of Europe's CEPEJ developed the European Ethics Charter (2018) establishing five core principles: fundamental rights, non-discrimination, quality and security, transparency, and user control.^[20]

AI's most compelling promise lies in expanding access to justice. India's e-Courts initiative reduced average case disposal time by approximately 25% in participating courts. Brazil's VICTOR system freed judicial resources for substantive legal reasoning. Egypt's AI transcription tools significantly reduced manual effort, and Argentina's Prometea achieved a 300% productivity increase.^[21] For marginalised populations, India's SUVAS overcomes language barriers for non-English speakers in a country where 78% do not speak English as a first language, while virtual court infrastructure enabled 30% increases in access for rural litigants globally.^[22]

5. Ethical and Legal Challenges

5.1 Predictive Analytics and Algorithmic Bias

Predictive analytics in criminal justice represents one of the most controversial AI applications. ProPublica's landmark 2016 investigation of COMPAS found that Black defendants were 45% more likely than white defendants to be incorrectly assigned higher risk scores. Black defendants who did not recidivate were nearly twice as likely to be misclassified as higher risk compared to white counterparts (45% vs 23%), while white defendants who re-offended were mislabelled low risk almost twice as often (48% vs 28%).^[23] Remarkably, the same predictive accuracy can be achieved with a simple two-feature classifier rather than COMPAS's 137 features, raising questions about the sophistication of commercial algorithms.^[24] Algorithmic bias originates from multiple sources: historical bias in training data reflecting discriminatory policing and prosecution practices; representation bias when training data underrepresents certain populations; measurement bias when proxy variables correlate with protected characteristics; and evaluation bias from unrepresentative benchmarks.^[25] Mathematical definitions of fairness are often mutually exclusive improving one metric may worsen another requiring explicit value judgments about which fairness criteria matter most. Effective mitigation requires combining technical

solutions (re-sampling, algorithmic fairness constraints, continuous monitoring) with policy reform, judicial education, and community engagement.^[26]

5.2 Biometric Technologies

Biometric technologies fingerprints, facial features, voice patterns, and iris scans offer significant benefits for identity verification but raise profound concerns. Facial recognition accuracy varies significantly across demographic groups, with false positive rates up to 100 times higher for Asian and African American faces compared to white faces.^[27] China's Smart Courts deployed facial recognition integrated with broader surveillance infrastructure, raising transparency concerns. Biometric data presents unique risks because, unlike passwords, biometric characteristics cannot be changed if compromised, making data breaches catastrophic. The EU's GDPR classifies biometric data as "special category data" requiring heightened protection, yet regulatory frameworks remain fragmented globally.^[28]

5.3 Transparency, Accountability, and Due Process

Transparency and explainability are foundational to responsible AI deployment in justice. Transparency refers to open access to a model's structure and decision-making logic, while explainability focuses on clarifying specific decisions. Post-hoc methods including SHAP (Shapley Additive Explanations) and LIME (Local Interpretable Model-Agnostic Explanations) interpret black-box models, though interpretability often trades off with predictive accuracy.^[29] The EU's GDPR establishes a right to explanation for automated decisions with legal effects, and the EU AI Act provides a 'right to explanation of individual decision-making' for high-risk systems, though scholars argue this right is narrowly defined and incompatible with modern machine learning.^[30]

AI systems introduce an 'accountability gap' because traditional legal frameworks assume human decision-makers bear responsibility. When an AI tool recommends a bail decision or recidivism risk score leading to wrongful detention, responsibility is diffuse among developers, vendors, administrators, and judges.^[31] The human-in-the-loop principle requires judges to retain ultimate decision-making authority; the EU AI Act mandates that human oversight must be 'meaningful' requiring judges to understand and critically evaluate AI outputs rather than blindly defer to them.^[32] Procedural fairness is equally threatened: the black-box nature of proprietary algorithms prevents defendants from cross-examining algorithmic evidence, violating adversarial fairness. Research demonstrates that AI use for judicial decision-making can negatively impact perceptions of procedural fairness, as litigants value the dignity, respect, and empathy that human judges provide.^[33]

5.4 Data Governance

The integrity of AI systems in justice depends fundamentally on data quality, representativeness, privacy, and security. Historical datasets often encode systemic biases from decades of discriminatory practices, causing AI systems to perpetuate existing inequities.^[34] In India, judgments are often not

published in machine-readable formats, hindering AI training and creating data gaps. Re-identification risks pose another threat: even anonymised datasets can often be de-anonymised by cross-referencing other sources. Adversarial attacks can manipulate AI outputs, model inversion attacks enable reconstruction of training data, and data poisoning can systematically degrade performance.^[35] Effective data governance requires privacy-by-design frameworks, data minimisation principles, transparency requirements, and independent audits.^[36]

6. Judicial Legitimacy and the Human Element

Judicial legitimacy depends not only on fair outcomes but on public confidence that decisions are reasoned, ethical, and explainable. At the centre of every judicial decision lies judicial judgment a blend of experience, empathy, and moral reasoning that no algorithm can replicate. Sentencing, bail, and custody decisions require consideration of context, compassion, and community safety, none of which can be reduced to data points.^[37] Judges increasingly face automation bias the tendency to trust machine-generated results despite contradictory evidence risking that they relinquish their central decision-making role.^[38] The judicial oath demands more than logical consistency; it requires conscience, judgment, and accountability.

Generative AI poses a potential threat to judicial independence by introducing undue influence on legal reasoning without critical analysis. Studies show a persistent public perception of a 'human-AI fairness gap', reflecting the view that human adjudications are fairer than algorithmic outputs.^[39] The path forward demands embracing technological progress while ensuring conscience, context, and accountability remain human.

7. Regulatory Frameworks and Governance Mechanisms

The EU AI Act (2024) represents the most comprehensive binding regulation of AI globally, categorising systems by risk level and imposing strict requirements on high-risk judicial applications, including human oversight, transparency, accuracy, and cybersecurity. Brazil's Resolution No. 615/2025 establishes a risk-based framework explicitly prohibiting AI from assigning value to personality traits or predicting recidivism in criminal reasoning.^[40] The UNESCO Recommendation on the Ethics of AI (2021), adopted by 193 member states, provides the first global standard-setting instrument on AI ethics, while the CEPEJ European Ethics Charter (2018) and UNESCO's Guidelines for the Use of AI Systems in Courts and Tribunals (2025) offer fifteen universal principles from transparency and accountability to human rights protection.^[41]

Effective governance requires three primary mechanisms: independent oversight bodies (such as Brazil's National Council of Justice and the EU AI Office), Algorithmic Impact Assessments evaluating fairness, accuracy, and accountability before deployment, and certification schemes with third-party verification. Canada's Directive on Automated Decision-Making requires impact assessments for all algorithmic government systems, while the ISO/IEC 42001 standard

establishes AI management system certification frameworks.^[42] Significant gaps remain: national laws are fragmented, soft law lax enforcement mechanisms, and regulatory frameworks struggle to keep pace with technological acceleration.^[43]

8. Implementation Challenges, Cost-Benefit, and Technical Infrastructure

UNESCO's AI Essentials for Judges and the MOOC developed with Oxford University are available in English, French, and Spanish, having trained over 11,000 legal professionals across 160 countries.^[44] Lawyers require training on how AI affects legal practice and ethical obligations, while court staff need technical training on case management systems and e-filing platforms. Significant challenges remain, including resource constraints, varying levels of digital literacy, and institutional resistance with only 17% of low-income economies implementing additional electronic features compared to 88% of high-income economies.^[45]

AI adoption should be treated as an investment decision. Courts must account for software, data preparation, cybersecurity, legacy system integration, maintenance, and staff training—the 'garbage in, garbage out' principle means poor data quality leads to costs compounding from both the initial tool and error correction.^[46] Funding models fall into four categories: public funding for core infrastructure; donor and development finance for low- and middle-income countries; public-private partnerships with strict safeguards against vendor lock-in; and shared-service models spreading costs across institutions.^[47]

Interoperability is the quiet backbone of scalable AI in justice. Without shared standards, case management platforms, e-filing portals, transcription tools, and legal databases operate in silos, requiring manual re-entry of information across systems. The European Interoperability Framework and India's e-Governance Interoperability Framework both emphasise the need for technical, semantic, and organisational interoperability so that public systems function as one connected ecosystem.^[48] Open standards protect courts from vendor lock-in and ensure long-term sustainability. AI in courts must also address remedies: accessible complaint channels, human review rights for AI-influenced decisions, record correction, and public reporting of systemic failures, working through layered mechanisms of internal complaint handling, independent oversight, and court-based remedies.^[49]

9. Public Trust, Future Outlook, and Policy Recommendations

The legitimacy of AI in justice ultimately depends on public trust. Research shows a persistent 'human-AI fairness gap', with the public perceiving human adjudication as fairer, even when AI produces accurate outcomes. Transparent disclosure of AI use, algorithmic logic, and decision-making criteria is essential for maintaining confidence.^[50] Marginalised groups including indigenous peoples, persons with disabilities, and low-income populations face compounded barriers; inclusive design principles require AI systems to accommodate diverse needs, and the digital divide risks creating a two-tier justice system without deliberate equity attention.^[51]

The future of AI in justice will be shaped by hybrid models combining machine efficiency with human judgment. Generative AI may assist with drafting orders and summarising case files, while privacy-preserving methods such as federated learning and blockchain-based audit trails may strengthen record integrity.^[52] Research must study how AI affects procedural justice, whether efficiency gains are distributed fairly, and which governance structures best prevent bias. Future inquiry should not only test accuracy but also ask whether AI improves dignity, trust, and the lived experience of justice.^[53]

A responsible roadmap should begin with a simple rule: use AI to improve service delivery, not to replace human judgment in rights-sensitive decisions. First, every court system needs a clear governance structure defining who approves AI tools, who monitors them, and who is accountable when harms occur with high-risk uses restricted unless there is strong legal authority, meaningful review, and evidence of fairness.^[54] Second, courts must invest in people, not just software; UNESCO and the NCSC both stress treating AI as an assistant and verifying all machine-generated outputs.^[55] Third, AI integration should be tied to measurable public value tracking whether AI reduces delay, lowers costs, and improves language access for rural and marginalised communities. National roadmaps should include periodic review, public consultation, and independent evaluation so that AI policy evolves with technology.^[56]

10. CONCLUSION

Artificial intelligence is reshaping the administration of justice in ways that were difficult to imagine a decade ago helping courts move faster, reduce backlog, improve translation, support research, and make legal systems more accessible to people historically excluded by distance, language, cost, or complexity. Yet the central lesson of this study is that efficiency alone cannot be the measure of progress. Justice is not only about speed. It is also about fairness, dignity, accountability, and the confidence that every person will be heard by a system that understands the human consequences of its decisions.

AI should assist judicial work, not replace judicial conscience. It should support human judgment, not narrow it. It should expand access to justice, not create a two-tier system in which only well-resourced institutions benefit from digital progress. This means placing strong limits on high-risk uses, demanding transparent governance, and ensuring human oversight remains real rather than symbolic. The future of AI in justice will depend less on the sophistication of the technology than on the seriousness of the safeguards around it. When used with care, AI can help build faster, more inclusive, and more responsive justice systems. Used carelessly, it can deepen distrust and inequality. The task ahead is to ensure that innovation remains firmly anchored in the values that give justice its legitimacy

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