Chapter 41

AI and India's Judicial System: Lessons from POCSO

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Short Bios

Abstract

Keywords:

1. Introduction

Artificial Intelligence (AI) and Machine Learning (ML) technologies have emerged as powerful tools with the potential to revolutionize large organizations.[1] As courts across the world increasingly digitize their operations, AI and ML offer promising avenues to streamline the processes of justice.[2] India's judiciary presents an especially compelling case for AI adoption given its existing digital infrastructure and pressing operational challenges.[3]

The scale of India's judicial backlog is staggering – there are currently over 45 million pending cases across the country's courts; more than 60% of these cases have been pending for over a year (National Judicial Data Grid, 2024). Delayed justice increases litigation costs, erodes public trust, and disproportionately affects vulnerable populations who cannot afford prolonged legal battles.[4] In commercial disputes, judicial delays create uncertainty that deters investment and impedes business operations, with estimates suggesting that pending cases collectively lock up economic value equivalent to 4.7% of India's GDP.[5]

Recent empirical research suggests that these issues stem from the misallocation of resources within the justice system. A recent granular analysis of the Delhi High Court, examining 8,086 orders across 1,129 cases filed between 2011-2015, revealed systemic inefficiencies including

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[1] Avi Goldfarb and CatherineTucker, "Digital Economics", *Journal of Economic Literature*, (2019), 57(1), 3-43.
[2] Katie Atkinson, Trevor Bench-Capon, and Danushka Bollegala. "Explanation in AI and law: Past, present and future." *Artificial Intelligence* 289 (2020): 103387.
[3] Sandeep Bhupatiraju, Daniel L. Chen, and Shareen Joshi, "The Promise of Machine Learning for the Courts of India", *National Law School of India Review* (2021): 33(2).
[4] Amrit Amirapu, "Justice delayed is growth denied: The effect of slow courts on relationship-specific industries in India." Economic Development and Cultural Change (2021) 70(1): 415-451.
[5] Daksh, 'State of the Indian Judiciary Report' (Eastern Book Company 2016) 23-47

judicial and counsel absenteeism, frequent adjournments, and insufficient court time for scheduled hearings.[6] Similar studies have been conducted in the Mumbai High Court.[7] This research broadly underscores the need for the Indian judiciary to improve its performance through the detailed analysis of data that is currently being gathered within the system.

This chapter examines how AI and ML can enhance judicial processes in India through a case study of the AI tools created to enhance the implementation of a single case type: the 2012 Prevention of Children from Sex Offences Act (POCSO).[8] In previous work, we have conducted a detailed empirical study of this legislation.[9] We note found that caseloads have grown nationwide, but there are significant variations in state capacity to process and settle cases. The problem is so severe that only two states resolve cases within the mandated one-year timeframe, and acquittals remain the predominant outcome across jurisdictions.

We propose that an AI-powered dashboard could significantly improve the administration of POCSO cases by addressing three key challenges. First, at the individual case level, it would provide real-time tracking of case progression through various stages, automatically flagging delays and procedural irregularities. Second, at the aggregate level, it would enable administrators and policy-makers to identify systemic bottlenecks, resource constraints, and regional variations in case processing. Third, it would facilitate evidence-based resource allocation by highlighting where additional judges, court staff, or other resources are most urgently needed.

The dashboard would achieve these improvements by integrating data from multiple sources, applying ML algorithms to detect patterns and anomalies, and presenting actionable insights to different stakeholders - from judges managing individual cases to administrators overseeing entire jurisdictions. If proven effective, this data-driven approach could serve as a template for improving judicial efficiency across other priority legislation.

Beyond case management, an AI-powered dashboard could drive systematic improvements in POCSO implementation. By analyzing patterns across jurisdictions, it could ensure sentencing consistency and identify emerging exploitation trends. The system would serve dual purposes: streamlining court operations through task automation while generating insights for judicial training and crime prevention. This data-driven approach would transform how courts protect children—from reactive case processing to proactive intervention.

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[6] Nikita Khaitan, Shalini Seetharam, and Sumathi Chandrashekharan. "Inefficiency and judicial delay: New Insights from the Delhi High Court". Vidhi Centre for Legal Policy Report (2017).

[7] Prashant Iyengar, "Adjudicating 'Litigotiation:' Cases Filed in the Mumbai Family Court*" Economic and Political Weekly* (2016), 51 (23).
Kshitiz Verma, Anshu Musaddi, Ansh Mittal, and Anshul Jain. "Estimating Time to Clear Pendency of Cases in High Courts in India using Linear Regression on NJDG Data." *Journal of Open Access to Law* (2024): 12(1).

[8] Government of India. The Protection of Children from Sexual Offences Act, 2012. Act No. 32 of 2012. 2012 Jun 19 [Cited 2024 Dec 30].

[9] Apoorva, Aditya Ranjan, Sandeep Bhupatiraju, Shareen Joshi and Daniel Chen, *A Decade of POCSO: Developments, Challenges and Insights from Judicial Data.* VIDHI Centre for Legal Policy and Justice, Access and Lowering Delays in India (Jaldi) (2022).

Research from other contexts, particularly health care systems, confirms a variety of benefits associated with the adoption of a data dashboard.[10] Even a relatively simple tool that displays critical information about cases in the system has been shown to improve efficiency as well as outcomes in clinics, hospitals and medical systems more broadly.

While the potential benefits are significant, it's crucial to address ethical concerns, ensure data privacy, and maintain human oversight in the application of AI and ML to sensitive areas like child protection. The integration of these technologies must be carefully planned and executed to complement, rather than replace, human judgment in the judicial process.

Despite these caveats, we believe that leveraging AI and ML, the Indian judicial system could not only enhance the implementation of POCSO but also set a precedent for using technology to improve the efficiency and effectiveness of other critical legislative frameworks. This approach aligns with broader efforts to modernize the judiciary in India and ensure timely, fair, and accessible justice for all citizens, especially vulnerable groups like children.

2. Background

2.1. The Indian Court System

Though India's legal system goes back several centuries, its contemporary judicial framework is rooted in the common law tradition introduced by the British colonial administration in the 19th century.[11] The current judicial system is shaped by the Constitution of India, which was written after independence in 1947. The justice system is vertically integrated, with the Supreme Court of India at the top, the high courts as the next tier, and subordinate courts at district, municipal, and village levels. Decisions made by higher courts are binding on the lower courts. The Supreme Court and High Courts have both original and appellate jurisdiction, while lower courts primarily handle original jurisdiction cases. The Constitution guarantees judicial independence through provisions for judges' appointments, tenure, and salaries.

While the Indian judiciary commands a high level of public trust, as noted earlier, it has been increasingly criticized for a growing backlog of cases, lengthy delays in outcomes, and broad inefficiency.[12] These challenges are particularly acute at the lower court level, where over 30 million cases remain pending, affecting citizens' access to timely justice.

2.2. Investments in Digital Judicial Infrastructure

The Indian judiciary has invested significantly in building a digital infrastructure over the past twenty years.[13] In 2005 the Chief Justice of India, R.C. Lahoti, established the Information

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[10] Saif S Khairat, Apoorva Dukkipati, Hope A Lauria, Timothy Bice, Debbie Travers, Shannon S Carson. The impact of visualization dashboards on quality of care and clinician satisfaction: integrative literature review. *JMIR Hum Factors* (2018):5(2):e9328.

[11] Marc Galanter. *Law and Society in Modern Indi*a (1963) Oxford University Press.
Mitendra R Jois. *Legal and constitutional history of India* (2004). Universal Law Publishing.

[12] Kshitiz Verma, Anshu Musaddi, Ansh Mittal, and Anshul Jain [n4]

[13] Sandeep Bhupatiraju, Daniel L. Chen, Shareen Joshi, and Peter Neis, “Impact of free legal search on rule of law: Evidence from Indian Kanoon”. NBER Working Paper (2021).

Technology and Judicial Reform Cell to promote the introduction of online legal information and services at all courts in the country.[14] This initiative led to the launch of the e-courts system, a nationwide digital platform that now connects over 18,000 courts across India.

Technology was rolled out at the courts of India in two distinct phases.[15] Phase I of India's e-courts project (2007-2015) established digital infrastructure across district courts. This involved installing hardware, networks, and Case Information Software (CIS) in court complexes, launching court websites, and training judicial officers and staff. The project included comprehensive data entry of pending cases and process re-engineering of court procedures.

The e-courts National portal (ecourts.gov.in), launched in 2013, provides online access to case status, cause lists, and judgments across 2,852 district and taluka (sub-district) courts. The National Judicial Data Grid (NJDG) now contains over 70 million case records and 33 million orders/judgments from India's district courts. This continuously updated database serves as a national data warehouse, providing real-time data on case-loads and case-progression through the system.

Phase II of the e-courts project expanded the digital transformation of India's judiciary begun in Phase I. The project enhanced hardware infrastructure across courts, implementing cloud computing architecture while maintaining local server rooms as network hubs. It introduced a unified Case Information Software that balanced national standardization with regional customization, ensuring interoperability across jurisdictions while accommodating local needs.

Aside from these platforms, there has been a proliferation of electronic databases of legal information that have improved citizen's access to legal information.[16] While there have been significant advancements in digitizing court records and processes, and some experimental pilots with automated tools for tasks like scheduling and document management, there has not yet been any widespread implementation or systematic adoption of artificial intelligence or machine learning technologies across the Indian judicial system.

2.3. POCSO

The Protection of Children from Sexual Offences (POCSO) Act, enacted in 2012, marks a significant milestone in India's efforts to address child sexual abuse. The Act emerged from a growing recognition of the need for a comprehensive legal framework specifically designed to protect children from sexual exploitation and abuse. India's ratification of the United Nations Convention on the Rights of the Child (CRC)[17] in 1992 played an important role in shaping the

[14] Mohan Gopal, 'E-Courts Project - Phase II: Objectives Accomplishment Report' (eCommittee of the Supreme Court of India 2019) https://main.sci.gov.in/pdf/E-Committee/Final-eCourts-Project%20Report-2019.pdf accessed 3 December 2024
[15] https://ecourts.gov.in/ecourts_home/static/about-us.php
[16] Bhupatiraju et al [n3].
[17] United Nations. General Assembly, & Canada. Human Rights Directorate. (1991). Convention on the Rights of the Child. Human Rights Directorate.

framework of the Act. The CRC obliged state parties to protect children from all forms of sexual exploitation and abuse[18]

POCSO emerged from extensive stakeholder consultations to create comprehensive legislation addressing various forms of child sexual abuse. The Act established Special Courts and child-friendly procedures for reporting, evidence collection, and trials, while mandating reporting of suspected abuse and protecting victims' identities. The 2019 amendment strengthened its provisions, notably introducing capital punishment for aggravated penetrative sexual assault cases.

Recent literature suggests that while the Act was ambitious in scope, its implementation has been uneven. Judges and court administrators lack awareness of some important aspects of the law and bring entrenched biases into their handling of the cases.[19] The procedures involved in reporting and processing crimes against children and adolescents are often cumbersome, intimidating, and can exacerbate the trauma experienced by the victims.[20] A recent study however, argues that even though reporting remains low and only 53,874 cases were registered across India in 2021, the law deters crimes against children -- data from the National Crime Records Bureau, reveals that the POCSO Act has reduced the growth rate of sexual offences against children, but this estimate cannot be easily interpreted because the causal pathway of the POCSO Act cannot be easily isolated from many other events and trends in Indian society over this time.[21] Numerous studies document the concerns with reporting and the heavy burden on those who do.[22]

We analyze POCSO cases as a focused sample of India's judicial data. These cases emerged after the e-courts system launch in 2012, receive priority treatment from courts, and represent a manageable dataset for examining broader patterns in case processing and institutional capacity.

2.4. Data

Our analysis draws on 220,000 POCSO cases from India's eCourts system (2020-21), spanning 28 states and territories.[23] This study, conducted by this research team in partnership with the Vidhi Centre for Legal Policy, aimed to analyze the implementation of the POCSO Act in India, particularly focusing on identifying challenges and variations in how the law is applied across different states. We examined a large volume of judicial data to understand trends in case

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[18] Articles 4,16,19 and 34 of the Convention of the Rights of the Child [n15].
[19] Satyam Sinha, B. Y. (2024). The POCSO Act: Judicial Insensitivity and Implementaion Issues. *IUP Law Review*, 14(3).
[20] Shivani Shukla, Pallabi Tiwari, Abhishek Datta, Sumeeta Agaarwal, Dimpy Goswami, Dev Dutt Galoria. “Legal Complexities of Adolescent Relationships: A Study of Protection of Child Sexual Offense Cases in India”. *Cureus.* 2024;16(5).
[21] Shrabanti Maity and Pronobesh Ranjan Chakraborty, “Implications of the POCSO Act and determinants of child sexual abuse in India: insights at the state level”. *Humanities and Social Sciences Communications* (2023);10(1):1-13.
[22] Rajeev Seth, and R. N. Srivastava. "Child Sexual Abuse: Management and prevention, and protection of children from Sexual Offences (POCSO) Act." *Indian Pediatrics* 54 (2017): 949-953.
[23] Apoorva et al. [n8]

pendency, conviction rates, and overall effectiveness of the POCSO courts in securing justice as stipulated by the Act.

We constructed this dataset through systematic extraction of case records from the eCourts platform, focusing on cases filed under the POCSO Act. For each case, we capture comprehensive procedural information including filing dates, hearing schedules, adjournments, interim orders, and final outcomes. The data structure allows us to track individual cases from initiation through disposition, while also enabling aggregate analysis of case processing speeds and resolution outcomes across courts and jurisdictions.

By examining aggregate patterns across jurisdictions, we could identify systemic issues that might not be apparent when looking at individual cases - such as regional variations in conviction rates, differences in case processing times between urban and rural courts, and the impact of court infrastructure and resources on case outcomes. This macro-level analysis is crucial for developing evidence-based policy recommendations to strengthen the implementation of the POCSO Act and better protect vulnerable children.

While our focus is on a single case-type, we emphasize this this analysis demonstrates both the potential and limitations of using e-courts data to understand India's judicial system. The dataset reveals patterns in case processing, institutional capacity, and outcomes that likely characterize the broader system rather than just POCSO implementation. While data quality varies - from incomplete demographic details to inconsistent case notes - these challenges themselves reflect systemic features of India's digital court records. This analysis thus serves as a valuable case study for understanding how AI tools might leverage e-courts data to improve judicial administration across all categories of law.

3. Main Findings of the POCSO Research

Our analysis of POCSO cases found substantial variations in even the most basic indicators of judicial efficiency across states.[24] These differences are apparent in the even the simplest of our indicators – the number of cases filed. As seen in Figure 1, Delhi reported 13.54 cases per 100,000 population in 2018, while several northeastern states showed much lower rates - likely reflecting differences in institutional capacity and reporting mechanisms rather than actual crime rates. The observation of high case loads for POCSO cases in Delhi are part of a broader trend – Delhi displays one of the fastest growing levels of pendency in India’s judicial system.[25]

We found similar variations in processing times. In Figure 2 we see some overlap with the pendency patterns. Delhi took 1,284 days to resolve a POCSO case in 2020, while Chandigarh averaged 215 days. This efficiency gap appeared in resolution rates as well (Figure 3). Tamil Nadu resolved over 80% of cases filed between 2012-2021, while Uttar Pradesh had over 77% pending. Case outcomes showed similar disparities (Figure 4) - in Andhra Pradesh, acquittals

[24] Apoorva et al. [n4]
[25] Kshitiz Verma, Anshu Musaddi, Ansh Mittal, and Anshul Jain. "Estimating Time to Clear Pendency of Cases in High Courts in India using Linear Regression." arXiv preprint arXiv:2307.12549 (2023).

reached 56% compared to 7% convictions, while Kerala showed a more balanced 21% acquittals and 16% convictions.

Our analysis also found that courts vary in their emphasis on justice delivery. Practices of victim compensation are hardly uniform across jurisdictions. Assam leads in this crucial aspect of justice delivery, directing compensation in 22% of judgments. Delhi and Maharashtra show moderate performance at 5% and 9% respectively, while Andhra Pradesh and Karnataka lag significantly, providing compensation in only 3% of cases.

Through qualitative research we also explored the variations in institutional infrastructure across the POCSO courts. Though all 408 POCSO courts were established under the Fast Track Special Court Scheme, we found that actual allocations of funding are unevenly distributed. Madhya Pradesh received significantly less than what was allocated, but Rajasthan exceeded its allocation. Staffing shows similar disparities, with Maharashtra having Special Public Prosecutors in only 42% of courts. These institutional gaps likely affect case outcomes, suggesting that infrastructure investment and court capacity are key determinants of judicial performance across India's legal system.

These findings highlight systemic challenges in India's courts: uneven institutional capacity, resource distribution, and monitoring capabilities. While some states demonstrate strong performance across reporting mechanisms, judicial efficiency, and support services, others struggle with coordinated response and implementation. The e-courts system generates extensive data, but courts lack tools to transform this information into actionable insights. This theme of disparities in capacity and performance of state-level governments is well-documented in Indian political economy, but has rarely been examined at the level of the judiciary.[26]

Overall, we believe there is a fundamental disconnect between data collection and data-driven decision making that affects resource allocation and justice delivery. Despite the significant investments in digitization, the deployment of the e-Courts system and the construction of the NJDG, there is insufficient use of the data to improve the performance of the judiciary. An AI-powered dashboard for specific case-types could be a valuable tool to address some of these systemic issues.

Proposal: Creating a Judicial Data Dashboard

We propose targeted electronic monitoring systems for specific case types, complementing the NJDG's comprehensive court-level data. While the NJDG tracks overall case status, focused dashboards could enable deeper analysis of processing patterns and resource needs within particular legal domains.

A pilot program focusing on case monitoring POCSO cases through AI-powered dashboards could demonstrate the broader potential for technology-enabled judicial reform in India. Such

[26] Somanathan, T. V., and Gulzar Natarajan. *State Capability in India.* Oxford University Press, 2022.
Kumar, K. Ramesh, I. Sivakumar, N. Saravanakumar, and R. Sathishkumar. "Regional disparities and Indian states: A macro level study." *Journal of Critical Reviews* 7, no. 13 (2020): 87-92.

dashboards could help track case progression, identify bottlenecks, and improve resource allocation across jurisdictions. While data quality remains a challenge, successful implementation in specific case types could provide a model for system-wide adoption, ultimately enhancing transparency and efficiency across India's courts.

Data dashboards - defined as visual interfaces that enable users to understand complex data and derive actionable insights - have proven effective in improving organizational efficiency and improved outcomes across various sectors.[27] In case of POCSO, such data dashboard could operate at different levels: track individual POCSO cases through the judicial process while also providing aggregate metrics to identify systemic patterns and bottlenecks. Information from the individual cases could be made available to litigants, lawyers and judges who are contesting the cases. Aggregated information at the district, state or regional level could be used by the senior judicial stakeholders to monitor progress and ensure that resources and support were appropriately directed to the states and courts where the cases are being contested.

AI tools can significantly enhance judicial monitoring and decision support.[28] Early systems like HYPO demonstrated the potential of case-based legal reasoning for trade secret law, though these were primarily used for educational purposes.[29] Recent advances show more practical promise - AI systems developed for the European Court of Human Rights achieved 97% accuracy in predicting case outcomes and gained positive feedback from lawyers for improving processing efficiency.[30] These tools combine machine learning with knowledge representation techniques to provide explainable predictions, making them particularly valuable for judicial decision support.

AI can also be useful to manage complex legal documents and extract critical information from them. At the very least, generative AI tools such as ChatGPT can create structured case summaries and automated deadline tracking. Such tools can also automate pattern recognition within case documents through intelligent document processing. Similar to the U.S. eDiscovery system, which efficiently extracts relevant legal text during disclosure proceedings, AI can automatically categorize and extract key information from POCSO case files, dramatically

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[27] Alper Sarikaya, Michael Correll, Lyn Bartram, Melanie Tory, and Danyel Fisher. "What do we talk about when we talk about dashboards?." *IEEE Transactions on Visualization And Computer Graphics* 25, no. 1 (2018): 682-692.
Steve Wexler, Jeffrey Shaffer, and Andy Cotgreave. *The Big Book of Dashboards: Visualizing Your Data Using Real-World Business Scenarios* (2017). John Wiley & Sons.

[28] Antonio Cordella, and Francesco Contini, (2020) *Digital Technologies for Better Justice – A Toolkit for Action.* Inter-American Development Bank, doi: http://dx.doi.org/10.18235/0002297

[29] Bench-Capon, Trevor JM. "HYPO's legacy: introduction to the virtual special issue." Artificial Intelligence and Law 25 (2017): 205-250.

[30] Joe Collenette, Katie Atkinson, and Trevor Bench-Capon. Explainable AI tools for legal reasoning about cases: A study on the European Court of Human Rights. *Artificial Intelligence* (2023): 317, 103861.
Masha Medvedeva, Michel Vols, and Martijn Wieling. Using machine learning to predict decisions of the European Court of Human Rights. *Artificial Intelligence and Law* (2020): 28(2), 237-266.

reducing administrative overhead.[31] This brings the possibility of significant gains in case processing speed – the eDiscovery system has been shown to be four times more efficient than humans.[32]

Beyond document processing, the data dashboard can integrate predictive analytics to forecast case trajectories. By analyzing historical judicial data, the system can project case durations, identify potential timeline violations, and optimize resource allocation. This capability has been proven effective in other jurisdictions - for instance, researchers working with Brazilian labor courts achieved 84% accuracy in predicting ruling timelines, while similar efforts with the ECtHR have reached 75% accuracy in predicting violations of the articles of the European Convention on Human Rights.[33]

In recent years, many courts across the globe have adopted similar systems. In 2022 the Probation and Pretrial Services Office of the Administrative Office of the United States Courts launched a series of statistical dashboards that would allow judges to view their own pretrial release rates by a variety of characteristics and compare them to the nation or their circuit or the district where they reside.[34] AI is also used by the US Sentencing Commission to develop and implement sentencing guidelines that ensure equitable and reasonable punishment.[35]

An AI risk-assessment tool known as COMPAS is available to judges in multiple states, such as New York, Pennsylvania, Wisconsin, California, and Florida, to receive a prediction of defendants' recidivism risk based on an algorithm that predicts the risk of recidivism based on variables such as past criminal activity, socioeconomic status, and psychological state.[36]

Similarly, China's Smart Court system uses AI to research case law, recommend relevant legislation and precedents, and suggest appropriate sentences based on prior cases.[37] Though these systems are not dashboard, they fulfill many similar functions as we envision being provided by a dashboard.

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[31] Agnes Kasper, and Eneli Laurits. Challenges in collecting digital evidence: a legal perspective. *The future of law and eTechnologies* (2016). 195-233.
Carlo Sansone and Giancarlo Sperlí. Legal information retrieval systems: State-of-the-art and open issues. *Information Systems* (2022): 106: 101967.
[32] Padmapriya Nagineni, "The Rise of AI in Ediscovery: How Machine Learning is Revolutionizing Legal Data Processing", *International Journal of Computer Engineering and Technology* (2024) 15(5): 329-341.
[33] de Oliveira, Raphael Souza, Amilton Sales Reis Jr, and Erick Giovani Sperandio Nascimento. "Predicting the number of days in court cases using artificial intelligence." *PloS one* (2022): 17(5): e0269008.
Medvedeva et al. [n 26]
[34] Thomas H. Cohen. The Pretrial Dashboards: Using Technology to Provide Judges with an Understanding of Their Pretrial Release and Detention Decisions. *Federal Probation* (2023): 87(3).
[35] Jesper Ryberg. Criminal justice and artificial intelligence: How should we assess the performance of sentencing algorithms? *Philosophy & Technology* (2024): 37(1): 9.
[36] Engel, Christoph, Lorenz Linhardt, and Marcel Schubert. "Code is law: how COMPAS affects the way the judiciary handles the risk of recidivism." *Artificial Intelligence and Law* (2024): 1-23.
[37]Wang, Nu. "'Black Box Justice": Robot Judges and AI-based Judgment Processes in China's Court System." In 2020 *IEEE International Symposium on Technology and Society* (ISTAS) (2020): pp. 58-65.
J.I. Weidong, The change of judicial power in China in the era of artificial intelligence. *Asian Journal of Law and Society* (2020): 7(3), 515-530.

Finally, there is the opportunity to learn from the cases themselves and improve jurisprudence. In Kenya, an experiment showed that sharing actionable instructions based on court data to the quarterly Court User Committee (comprised of the presiding judges or heads of court stations, representatives of lawyers, police, prosecutors, and probation officers) decreased adjournments by 20% and resulted in a reduction in the case duration by 22%.[38]

These international examples suggest that AI-powered dashboards could help India's courts move beyond data collection to data-driven decision making, improving efficiency and access to justice across the judicial system.

Risks and Challenges of AI Powered Data Dasboard

The successful integration of AI tools into India's judiciary depends on data quality. While the e-courts platform serves 18,000 courts, studies have documented significant data inconsistencies.[39] Our POCSO case analysis revealed widespread variations in how laws are referenced and frequent data entry errors. Improving the e-courts system requires both standardized data protocols and robust validation mechanisms to ensure consistency across jurisdictions.

Privacy and security considerations are also paramount given the sensitive nature of POCSO cases. Any implementation must comply with India's data privacy laws, which are rapidly evolving and imposing significant limits on the extent to which health or personal records can be shared without informed consent of the participant.[40] The system must also maintain comprehensive audit trails for judicial stakeholders to follow-up on cases while automatically redacting identifying information in public-facing components.

The integration of AI in judicial processes raises important ethical questions that require careful consideration. Historical data may contain existing biases in judicial outcomes, necessitating robust bias detection and mitigation strategies. Recent work evaluating the COMPAS tool discussed earlier, have argued that the algorithm may suffer from similar forms of bias as human judges.[41] Here we emphasize that while AI can enhance efficiency, human judgment must remain central to decision-making, with the dashboard serving as a decision support tool rather than a replacement for judicial discretion. Additionally, the algorithms' decision-making processes must

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[38]Daniel L. Chen, Jimmy Graham, Manuel Ramos Maqueda, and Shashank Singh "Prejudice in Practice: Examining the Sources and Targets of Bias in Kenya's Judiciary." Available at SSRN 4462696 (2023).
, Matthieu, Chemin, Daniel L. Chen, Vincenzo Di Maro, Paul Kieti Kimalu, Momanyi Mokaya, and Manuel Ramos-Maqueda. "Data Science for Justice: The Short-Term Effects of a Randomized Judicial Reform in Kenya." (2023).

[39] Devendra Damle and Tushar Anand. "Problems with the e-Courts data." *National Institute of Public Finance and Policy Working Paper* 314 (2020).

[40] Oluwatosin Reis, Nkechi Emmanuella Eneh, Benedicta Ehimuan, Anthony Anyanwu, Temidayo Olorunsogo, and Temitayo Oluwaseun Abrahams. "Privacy law challenges in the digital age: a global review of legislation and enforcement." *International Journal of Applied Research in Social Sciences* 6, no. 1 (2024): 73-88.
Dipika Jain, "Regulation of digital healthcare in India: ethical and legal challenges." *Healthcare* (2023) 11(6): 911.

[41] Julia Dressel, Hany Farid, “The accuracy, fairness, and limits of predicting recidivism,” *Science Advances* (2018) 4:eaao5580.

remain transparent and open to scrutiny. The dashboard, even with AI functionality, serves as a tool rather than as a lawyer itself.

Given these challenges and considerations, it would be prudent to consider a phased implementation approach beginning with pilot programs in high-performing states like Tamil Nadu and Kerala. This initial phase would establish baseline metrics, conduct training, and gather user feedback before expanding to national implementation over 12-24 months. Success requires significant resource allocation, including technical infrastructure, training programs, and ongoing support systems.

The successful implementation of this dashboard could serve as a model for other areas of India's judicial system. However, success will require sustained commitment from all stakeholders, adequate resource allocation, and careful attention to ethical and privacy considerations. Regular monitoring of metrics such as case processing time, consistency in judicial outcomes, and system reliability will be crucial for evaluating effectiveness and guiding continuous improvement.

Conclusion

Our analysis of Indian court records over the past decade reveals both opportunities and obstacles in modernizing the judicial system through technology. The significant variations in case processing times, resolution rates, and outcomes across jurisdictions for a single type of case highlight the need for better monitoring and standardization. AI-powered court management systems could address these challenges by improving case tracking, resource allocation, and decision support.

While implementing AI in India's courts presents technical and ethical considerations - from data quality to judicial independence - the potential benefits warrant careful exploration. These include faster resolution times, more consistent case management, and improved resource distribution across jurisdictions. Successfully piloting AI tools in specific areas of law, such as the special case of POCSO cases, could provide a framework for broader judicial modernization. As courts globally work to balance technological innovation with procedural fairness, India's experience could offer valuable insights for judicial systems worldwide.

Tables and Figures

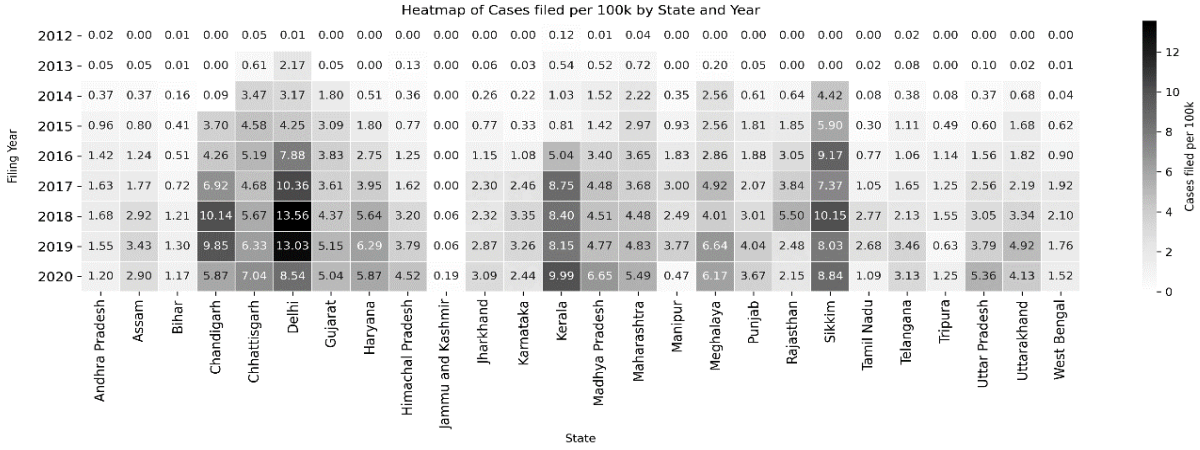

Figure 1: The number of cases filed in each state normalized by the population of the state (using the 2011 census, and the official figures for new states). We divide the total number of cases by the population of the state and multiplying the resulting number by 100,000. The darker shading of the cell, corresponding to a year and a state, represents a higher filing rate. For example, a value of 10 is to be interpreted as 10 cases filed per 100k persons in the given state and year.

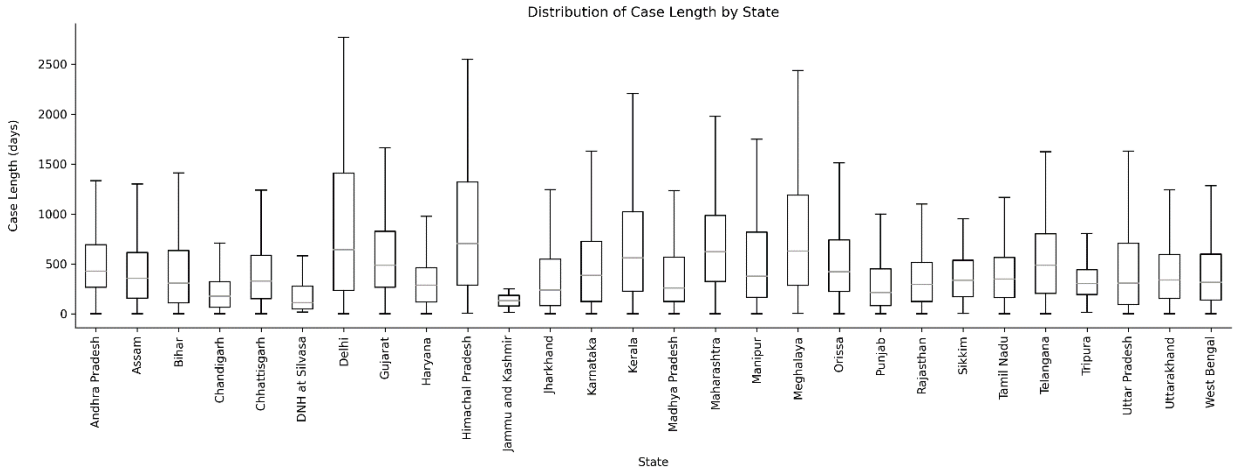

Figure 2: Case-length by state. Notes: This is the distribution of (disposed) case resolution times (in days) across the states of India. Case length is computed as the time in days between the filing date and the disposal date, and we consider all disposed cases within the study period. Each box represents the middle 50% (the inter quartile range) of case lengths, with the line inside the box indicating the median time to resolve a case. Whiskers extend to show the typical range of case lengths, while points outside the whiskers (not represented here for simplicity) are outliers—cases with unusually long or short resolution times.

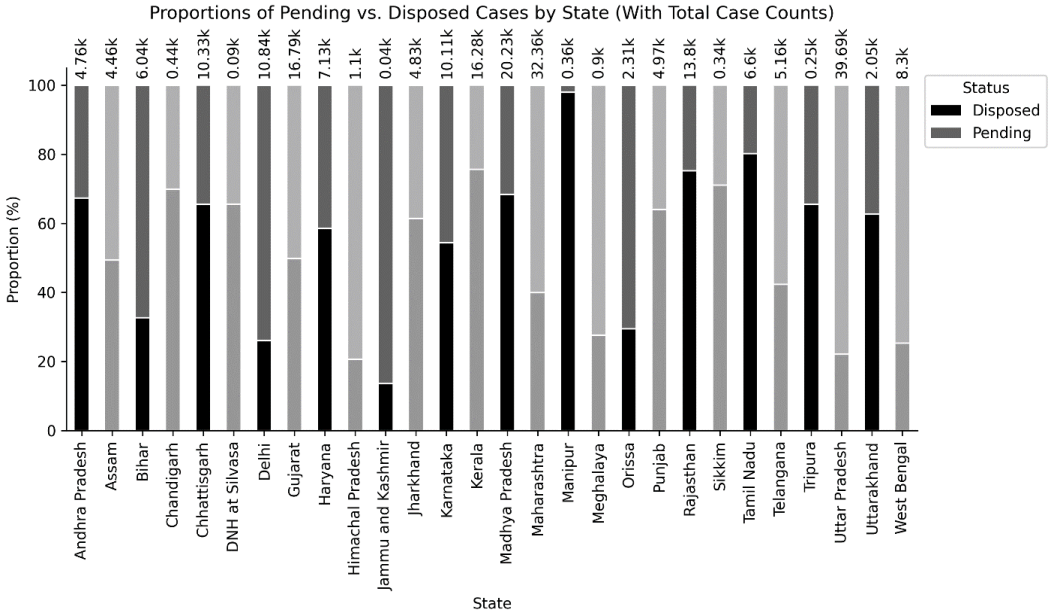

Figure 3: The proportion of pending and disposed cases across states.

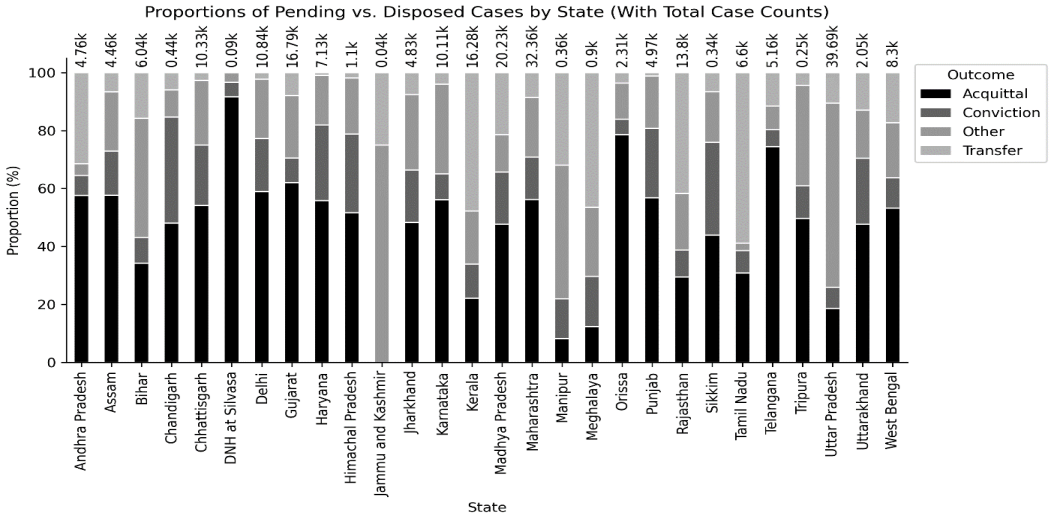

Figure 4: The proportions of the different outcomes of the disposed cases by state. Each resolved case is categorized into one of the following outcomes: Acquittal, Disposal, Transfer, or a general category labeled Other, and the proportion of cases tagged with these categories are stacked within each state.