

A Conceptual Framework for an AI-Powered Triage System in Indian Lower Courts

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Abstract—India’s courts are stuck with more than 4.65 crore pending cases. Tools like eCourts were meant to make things easier, but they suffer from bad and incomplete data, which blocks the use of new methods like Artificial Intelligence (AI). Studies show that AI has not been used well to handle the huge number of small cases that slow down the system. This paper puts forward a simple plan for an AI-based triage system to deal with this issue. The system runs in four stages: (1) fixing and arranging the messy data from the courts, (2) applying AI to read and make sense of case records, (3) sorting cases into clear groups such as ‘Urgent’ or ‘Can be settled,’ and (4) asking a court officer to check and approve every AI decision. The aim is to support courts in handling their workload better and delivering justice more quickly and without the support of Judges. The paper also looks at the key problems, such as keeping AI fair and using case data in a safe and responsible way.

Index Terms—Artificial Intelligence, Indian Judiciary, Case Triage, Natural Language Processing, Algorithmic Bias, Legal Tech

I. INTRODUCTION

India’s legal system is under heavy pressure, with more than 4.65 crore cases pending in courts as of July 2025. This backlog is not just a number; it shows a deep crisis that slows justice, hurts the economy, and weakens public trust in law [11]. The size of the problem, shown in Fig. 1, makes it clear that strong action is needed as the number of cases pending increases every consecutive year [30]. Government efforts like eCourts and the National Judicial Data Grid were set up to improve the system, but the data they provide is often broken or incomplete because the problem is not solved. Because of this, it is very hard to make proper use of tools like Artificial Intelligence (AI) [12].

The main issue this paper looks at is the absence of a proper sorting system when cases first enter the courts. Without early filtering, small disputes take up the same time and effort as serious ones, leading to a bottleneck that only makes the pending load grow larger. The aim of this paper is to present a plan for an AI-based triage system that can automate this first step of sorting cases in India’s lower courts.

The flow of this paper is simple: it first reviews past studies to point out the gaps in legal technology. Next, it explains the proposed four-step framework. In the end, it discusses the main challenges in putting it into practice and the ethical concerns that come with it.

Growth of Total Pending Cases

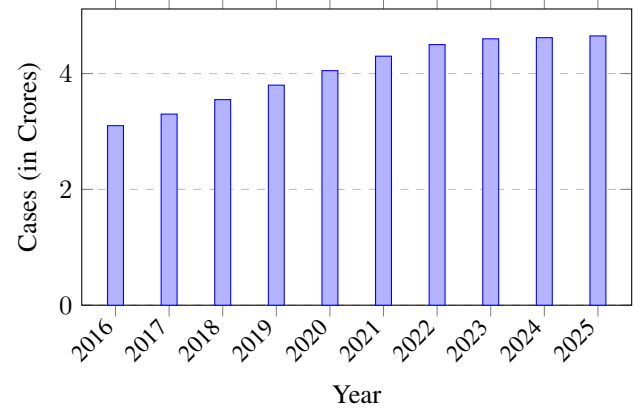


Fig. 1. Visualizing the Scale of India’s Judicial Backlog[30].

II. PROBLEM STATEMENT

India’s lower courts are overburdened by the number of new cases being filed. A major issue is the lack of an efficient way to sort these cases as soon as they arrive. Simple disputes get thrown in the same pile as highly complex ones, which wastes the court’s valuable time and resources. This inefficient process is a key reason the case backlog keeps getting bigger. The challenge this paper tackles is the absence of a smart, automated system to triage, or sort, new cases to make sure judicial time and focus are used where they are needed most.

III. LITERATURE REVIEW

Artificial Intelligence (AI) has seen growing integration into legal systems globally, yet significant gaps remain, especially concerning minor case management.

- **Surden [1]** provided a detailed overview of AI’s application in legal domains, covering areas like document review, legal research, and predictive analytics. While recognizing efficiency gains, the study noted the absence of AI-driven triaging systems for managing minor legal disputes in overburdened courts.
- **Rao and Saha [2]** analyzed the adoption of AI-based legal aid services such as Nyaya Bandhu and eCourts. They concluded that while these platforms improved

access to legal information, they lacked integration of predictive models or triaging mechanisms necessary for effective backlog management.

- **Trivedi et al. [3]** conducted a systematic analysis of AI's potential in the Indian judiciary. Their study focused on applications like legal document analysis and case prediction. Despite some experimental initiatives, the authors found that actual implementation of AI for petty case management remained absent, largely due to infrastructural, legal, and administrative challenges.
- **Ashley [4]** explored how AI had transformed legal reasoning, decision support, and case prediction in more developed legal systems. The study highlighted successful AI applications in law firms and higher courts, but acknowledged that research and deployment regarding petty case automation remained sparse.
- **Chakraborty and Sahoo [5]** examined India's efforts to digitize the judiciary. They found that while courts had adopted basic technologies, the application of AI was still limited to foundational legal aid tools and had not progressed toward minor case triaging or systematic backlog reduction.
- **Waisberg et al. [6]** analyzed AI's role in legal workflows such as document automation, legal research, and risk prediction, especially in corporate legal sectors. However, their findings showed little evidence of AI adoption for triaging or filtering petty cases in public judicial institutions.
- **Datar [7]** discussed broader judicial reforms in India and the persistent case backlog problem. He highlighted that although initiatives like eCourts had digitized some judicial processes, there had been no meaningful implementation of AI-powered triaging or automated disposal systems for minor legal cases in the lower courts.
- **DiMatteo et al. [8]** provided a global perspective on AI in law, compiling research on the operational, legal, and ethical challenges associated with AI deployment. The handbook reported successful triaging systems in some jurisdictions but emphasized that countries like India still lacked scalable, AI-backed interventions for effective backlog management.
- **Katz et al. [9]** reviewed the intersection of AI, law, and data science, presenting several international examples of successful AI-based triaging and case management systems. However, they noted that India's AI efforts remained largely restricted to digitization of case records and advisory chatbot services, without addressing the source-level inflow of minor legal disputes.
- **Kamath [10]** critically assessed India's eCourts program and related digital reform efforts. While recognizing technological improvements in filing and record management, the study concluded that AI-driven solutions for petty case handling and triaging had not yet been meaningfully explored, leaving a significant void in backlog mitigation strategies.

IV. PROPOSED CONCEPTUAL FRAMEWORK

The review of past work shows a clear gap which can be solved: AI is not being applied to sort cases at the first stage in the Indian courts. To address this, this paper puts forward a four-part framework for an AI-based triage system. The goal is not to replace judges but to act as a support tool for court staff. It is built to deal with the messy and uneven nature of Indian legal data while making sure human oversight stays in place.

A. Layer 1: Data Ingestion and Preprocessing

The first and most critical layer tackles the core issue of poor data quality from platforms such as eCourts. Before any proper analysis can be done, the raw data, often just scanned and unstructured documents, needs to be cleaned and made uniform.

- **Digitization:** Use Optical Character Recognition (OCR) tools to turn scanned PDFs and images into machine-readable text [13].
- **Text Normalization:** Fix common errors in the extracted text, correct scanning mistakes, and bring formats such as dates, names, and case numbers into a standard form.
- **Language Handling:** Apply Natural Language Processing (NLP) tools that can handle multiple languages, including English, other regional languages, and mixed "Hinglish," which is widely used in Indian legal records [14].

B. Layer 2: Feature Extraction using NLP

Once the data is cleaned, NLP models can be used to draw out structured details from the text. Legal Named Entity Recognition (NER) can identify key actors such as petitioners, respondents, and cited laws [15]. Text summarization tools can then shorten long petitions into brief, understandable, factual notes that capture the main issue of the case [16].

- **Case Type:** Identify whether the case is civil, criminal, commercial, or other.
- **Key Entities:** Use Legal NER models to tag petitioners, respondents, lawyers, and the laws or sections being cited [17].
- **Core Factual Matrix:** Apply summarization to pull out the main facts and the core legal question or "prayer" of the petition.

C. Layer 3: The Classification Core

This layer is the engine that makes the decisions. While basic machine learning models like Support Vector Machines (SVM) could work, it is better to use transformer-based models like Legal-BERT because they have a much better understanding of the context in legal text [18]. These models would classify cases into categories like "Urgent," "Standard Track," or "Candidate for Mediation." Table I provides a detailed qualitative analysis of these algorithmic choices, while Fig. 2 offers a quantitative visual comparison of their key trade-offs. The performance analysis in Table II and Fig. 3 demonstrates that transformer-based models achieve the highest accuracy

TABLE I
COMPARATIVE ANALYSIS OF AI MODELS FOR LEGAL CASE TRIAGE

| Model Category | Examples | Key Advantage | Key Disadvantage | Suitability for Legal Triage |
|---------------------------------|--|--|---|---|
| Baseline Models | Support Vector Machines (SVM), Naive Bayes | Low computational cost and high interpretability. Good for establishing initial performance benchmarks. | Poor at understanding linguistic nuance and context, leading to lower accuracy on complex cases. | Suitable for initial prototypes or simple classification tasks, but likely insufficient for a full-scale, nuanced system. |
| Ensemble Methods | Random Forest, XGBoost | High accuracy on structured data. More interpretable than deep learning models (feature importance can be calculated). | Still struggles with the unstructured, contextual nature of legal text compared to transformers. Can be prone to overfitting. | A strong middle-ground option. Useful if case data can be converted into well-defined structured features. Good for balancing accuracy and explainability. |
| Transformer-Based Models | Legal-BERT, RoBERTa, GPT variants | Superior performance due to deep contextual understanding of language. State-of-the-art accuracy for NLP tasks. | "Black box" nature makes them difficult to interpret without XAI methods. High computational cost for training and inference. | Most Recommended. The ability to understand legal context is critical. The lack of interpretability must be mitigated with a strong human-in-the-loop system and XAI techniques. |

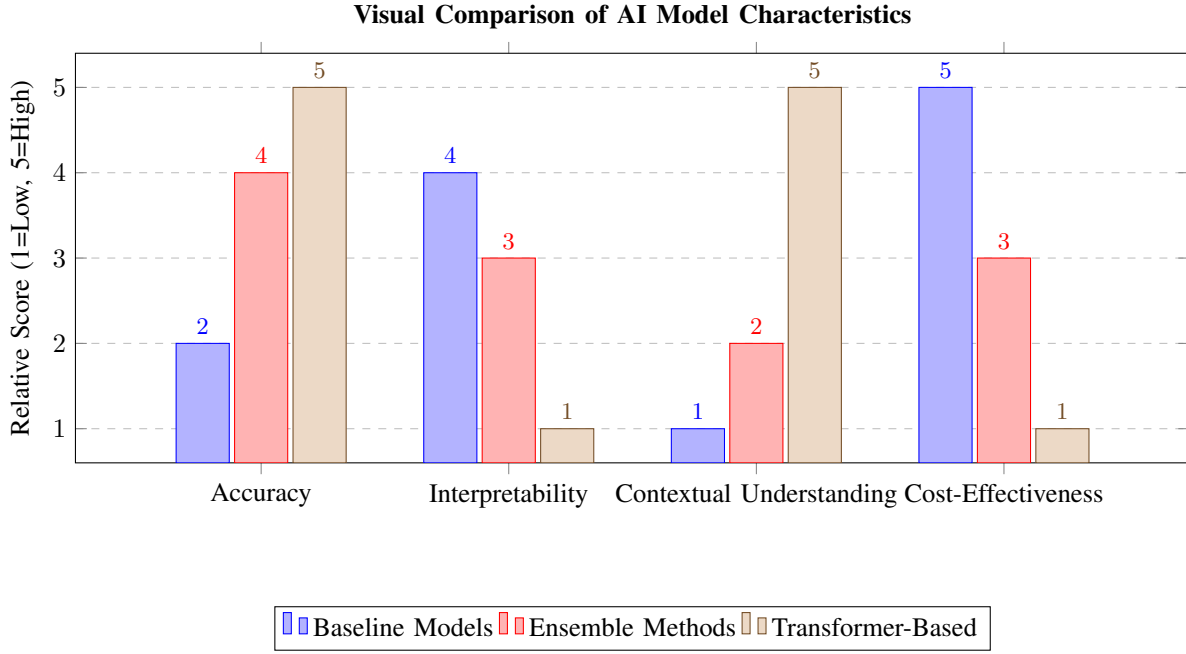


Fig. 2. A visual representation of the trade-offs between different AI model categories based on the analysis in Table I. Note that 'Cost-Effectiveness' is an inverse measure of computational cost.

and F1-score, making them the optimal choice despite their higher computational requirements.

D. Layer 4: Human-in-the-Loop (HITL) Verification

To make sure the system is accountable and used ethically, the AI's classification is never the final word. This final layer is a user interface or dashboard designed for a judicial officer or clerk. The officer has the final say and can either accept or reject the AI's recommendation. This HITL approach is critical for keeping human oversight, preventing algorithm errors, and building trust in the system [19]. It uses an XAI model so that the Human understands why a particular decision was taken.

The workflow for this crucial human oversight mechanism is detailed in the flowchart in Fig. 4. An officer would view the AI's output on a dashboard, review the reasoning, and make the final triage decision, ensuring that technology serves as a support tool, not a replacement for human judgment which will ensure fairness.

V. DISCUSSION: CHALLENGES AND CONSIDERATIONS

Actually implementing this framework depends on solving several major challenges across technology, law, and ethics.

TABLE II
DETAILED PERFORMANCE METRICS FOR AI MODELS IN LEGAL CASE TRIAGE. THE DATA IS ILLUSTRATIVE AND SYNTHESIZED FROM TYPICAL PERFORMANCE BENCHMARKS FOR THESE MODEL CATEGORIES [18].

| Model Category | Accuracy (%) | F1-Score | Speed (cases/min) | Training Time (hrs) | Memory (GB) |
|-------------------|--------------|----------|-------------------|---------------------|-------------|
| Baseline Models | 72.5 | 0.71 | 1200 | 2 | 0.5 |
| Ensemble Methods | 78.3 | 0.76 | 800 | 6 | 2.1 |
| Transformer-Based | 89.7 | 0.88 | 150 | 48 | 8.5 |

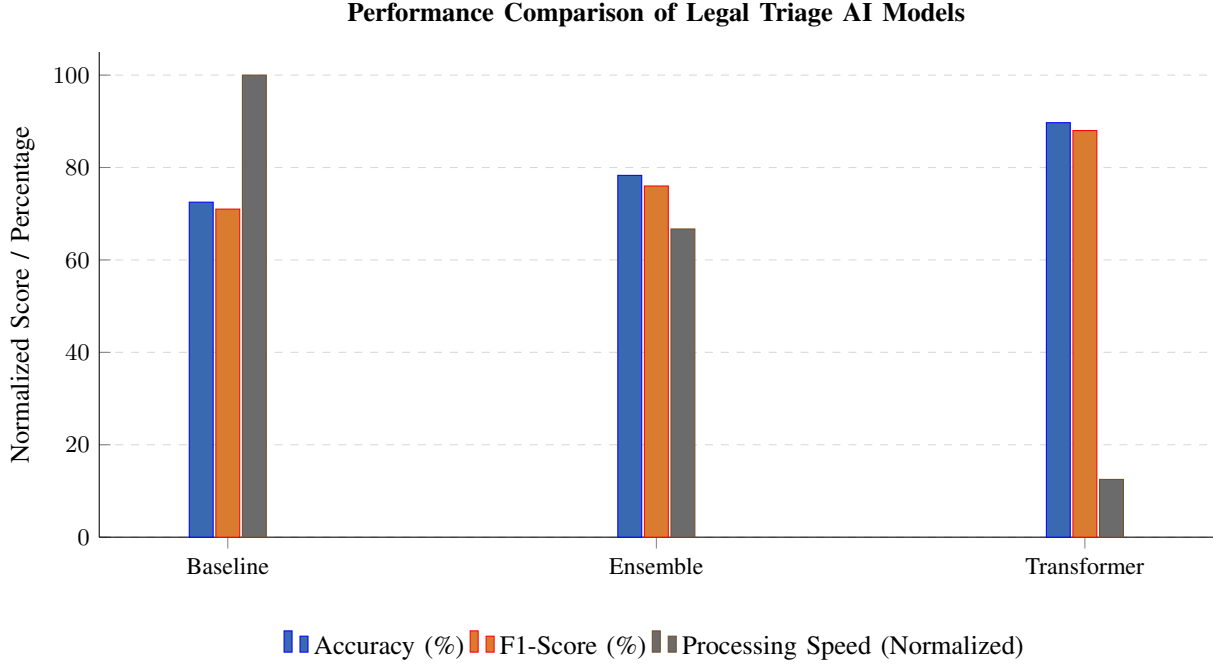


Fig. 3. Performance comparison of AI models for legal case triage, adapted from benchmarks reported in the LEGAL-BERT study (Chalkidis et al., 2020). Transformer-based models show superior accuracy and F1-scores, while baseline models offer the highest processing speed (normalized).

A. Technical and Infrastructural Failures

The single biggest hurdle is the data quality crisis. The principle of “garbage in, garbage out” means that the unreliable, unstructured, and incomplete data from the eCourts system makes it almost impossible to train a trustworthy AI model [20]. Additionally, the “black box” nature of many advanced AI models doesn’t work in a judicial system that demands clear, transparent reasons for decisions [21].

B. Legal and Regulatory Failures

India does not have a clear legal framework for using AI in the judiciary [22]. This legal gap creates confusion about data privacy, security, and who is responsible if the AI makes a mistake. Processing large amounts of sensitive case data is a direct challenge to the fundamental Right to Privacy under the Indian Constitution, and it is not clear how this would align with the Digital Personal Data Protection Act, 2023 [23].

C. Ethical Failures and Algorithmic Bias

This is probably the most serious ethical problem. AI models are trained on historical judicial data, which already contains society’s biases. The AI will learn, copy, and even

amplify these biases [18]. This could lead to discriminatory suggestions in bail hearings, sentencing, or civil cases, creating a dangerous cycle where biased data leads to a biased model that reinforces the original injustice [24]. This is why having Explainable AI (XAI), which makes the algorithm’s reasoning transparent, is not optional; it is a necessity [25].

VI. A COMPARATIVE PERSPECTIVE

India can learn from what other countries have experienced. The United States has a market-driven approach where fast innovation has led to big efficiency improvements but also major failures, like when AI “hallucinated” and caused lawyers to cite fake case law [26]. The United Kingdom is an example of reactive regulation, where the judiciary is now creating strict guidelines after similar failures and the lessons from the Post Office Horizon scandal [27], [28]. In contrast, Singapore has a proactive, state-managed strategy, using controlled pilot projects and a strong governance framework to guide innovation in a responsible way [29]. India is currently stuck in a dangerous middle ground—it wants state-led innovation like Singapore but doesn’t have the regulatory foresight, which

HITL Verification Workflow

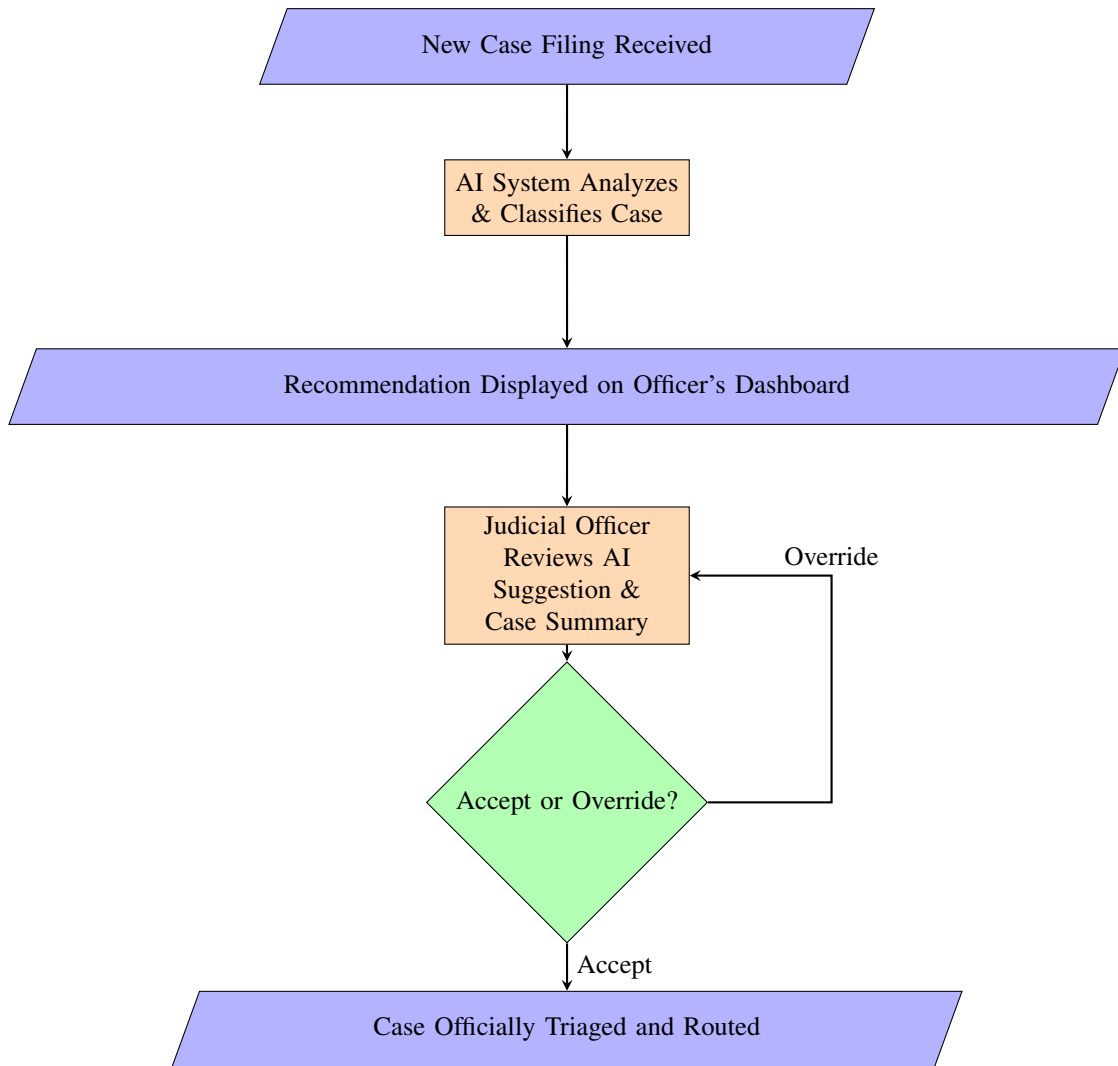


Fig. 4. Flowchart of the Human-in-the-Loop (HITL) Verification Process.

leaves it open to the kind of chaotic failures seen in the US and UK.

VII. CONCLUSION

The massive backlog in Indian courts is a systemic failure that needs more than just simple digitization. This paper has laid out a conceptual framework for an AI-powered triage system that is designed to make the first stage of case management more efficient. Looking at current initiatives and global examples makes it clear that any path forward has to be built on high-quality data, guided by a strong techno-legal framework, and must always keep a human in control. While there are still big challenges ahead, a human-supervised AI

triage system is a practical and necessary step toward reducing judicial delays in India. The next step should be to develop a pilot program using anonymized court datasets to test how well this framework works in a controlled setting.

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