

Artificial Intelligence and the Evolution of Criminal Trial Procedures: A Comparative Study of CrPC, 1973 And BNSS, 2023

Ankita Kumari Dhaker¹, Dr. Priyanka Joshi²

Abstract

Artificial Intelligence (AI) is redefining legal landscapes across the globe, influencing procedural justice, evidence assessment, and courtroom dynamics. In India, the longstanding procedural framework under the Code of Criminal Procedure, 1973 (CrPC, 1973) met transformative conceptual reform with the Bharatiya Nyaya Sanhita, 2023 (BNSS, 2023). This article explores the synergy between AI and criminal trial procedures, comparing the traditional mechanisms of the CrPC, 1973 with the modern aspirations of the BNSS, 2023. It assesses how AI applications such as predictive analytics, automated evidence review, and machine learning tools integrate with procedural reforms to enhance efficiency, accuracy, and fairness. The article also situates India's experience within international perspectives, analysing global trends in AI adoption in criminal justice systems. Through a critical examination, it identifies opportunities, limitations, and future directions for AI-enabled criminal trials in India. The study concludes that while AI presents transformative potential, ethical safeguards, regulatory clarity, and jurisprudential stewardship remain essential to ensure just outcomes.

Keywords: Artificial Intelligence, Criminal Trial Procedures, Code of Criminal Procedure, 1973, Bharatiya Nyaya Sanhita, 2023, Predictive Analytics, Courtroom Innovation, Evidence Management, Procedural Reform, AI Ethics

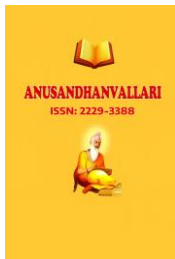
Introduction

Artificial Intelligence (AI) has rapidly evolved from theoretical computation to practical tools reshaping institutional processes. In criminal justice, AI promises efficiency gains through automated evidence processing, predictive crime models, and decision-support systems that can identify patterns humans might overlook (Surden, 2019). However, AI's integration raises philosophical, ethical, and procedural questions about fairness, accountability, and transparency (Calo, 2016). For nations with large caseloads and procedural delays, like India, AI offers both hope and caution.

The **Code of Criminal Procedure, 1973 (CrPC, 1973)** has been the backbone of India's criminal justice process, prescribing detailed procedures for investigation, trial, and appeal. Despite its comprehensiveness, CrPC, 1973 has been critiqued for procedural delays, backlogs, and archaic provisions not suited for digital age challenges (Malik, 2007). In response, the Government of India introduced the **Bharatiya Nyaya Sanhita, 2023 (BNSS, 2023)** a modernized procedural code intended to streamline trials, embrace digital evidence, and respond to contemporary societal needs. The BNSS emphasizes efficiency, victim centricity, and incorporates provisions that implicitly invite the use of technology like AI.

¹ Research Scholar, Apex School of Law, Apex University, Jaipur-303002

² Assistant Professor (Supervisor), Apex School of Law, Apex University, Jaipur-303002



This article examines how AI can harmonize with criminal procedure reforms in India, comparing CrPC, 1973 and BNSS, 2023, while drawing lessons from international approaches to AI in criminal justice. The discussion critically explores whether AI's integration aligns with principles of justice, due process, and human rights.

Historical Background

Legal systems evolve with societal needs, and criminal procedure codes reflect the balance between state power and individual rights. Historically, procedural law in India emerged from colonial legal frameworks post-independence, culminating in CrPC, 1973. Drawing on British common law traditions, CrPC, 1973 aimed to codify investigation, arrest, trial, and appellate processes for efficiency, fairness, and consistency (Jhabvala, 1975). Over decades, amendments responded to emerging crimes and constitutional mandates, yet the procedural core remained anchored in a manual, paper-based, and time-intensive system.

Artificial Intelligence emerged in the mid-20th century, with early conceptualization by Turing (1950) and Dartmouth Conference scholars (McCarthy et al., 1956). Through the latter half of the 20th century, AI transitioned from symbolic logic and expert systems to machine learning and neural networks (Russell & Norvig, 2016). In legal contexts, initial AI applications focused on document search and case retrieval (Ashley, 2017), gradually progressing to predictive models for legal outcomes (Katz, Bommarito & Blackman, 2017).

Parallel to technological evolution was a global reinvention of criminal procedures. Countries began integrating digital evidence, electronic filings, and procedural codifications that could accommodate technological tools. In India, the urgent need for modernization became pronounced as digital crimes surged and court backlogs grew (National Judicial Data Grid, 2022).

The BNSS, 2023 represents a landmark procedural overhaul. With a structure designed to improve speed, clarity, and incorporate digital capabilities, the BNSS departs from dated terminologies and processes in CrPC, 1973. While the BNSS itself does not explicitly mandate AI, its embracement of digital evidence, real-time data, and procedural efficiency aligns with AI-enabled functionalities.

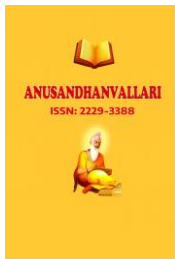
Historically, AI's legal integration began cautiously through research and advisory tools but is gaining judicial acceptance in evidence analysis, risk assessments, and court management systems worldwide (Susskind, 2019). In countries like the United States, the UK, and Estonia, AI pilot programs for predictive analytics and digital processing reflect global tendencies to modernize justice systems. India's procedural reforms, encapsulated by BNSS, 2023, present a unique opportunity to embed these global advances within its jurisprudential ethos.

Artificial Intelligence: Concepts and Legal Relevance

Artificial Intelligence refers to systems that can perform tasks typically requiring human intelligence, including reasoning, learning, and pattern recognition (Russell & Norvig, 2016). In criminal trials, AI applications range from document classification and evidence sorting to predictive modelling of case outcomes and automated decision support.

Two primary AI dimensions are relevant:

1. **Machine Learning (ML):** Algorithmic systems that learn from data patterns to make predictions or classifications.
2. **Natural Language Processing (NLP):** Systems that interpret, analyse, and generate human language content critical for parsing legal texts, evidence transcripts, and judgments.



AI's potential in criminal procedure includes:

- **Evidence Management:** AI can efficiently analyse large datasets (e.g., digital communications, surveillance footage) and identify relevant patterns (Marx, 2016).
- **Predictive Analytics:** AI may predict case durations, likely legal outcomes, or even crime hotspots useful in resource allocation (Brantingham et al., 2018).
- **Decision Support:** AI can aid judges by summarizing precedent, highlighting inconsistencies, or suggesting relevant statutory interpretations (Surden, 2019).

However, AI's use raises ethical issues: bias in algorithms, explainability in legal decisions, due process implications, and accountability when automated systems influence human judgments (Calo, 2016, Barocas & Selbst, 2016). Legal frameworks must thus ensure AI is a tool not a substitute for judicial reasoning.

Artificial Intelligence in Investigation and Pre-Trial Processes

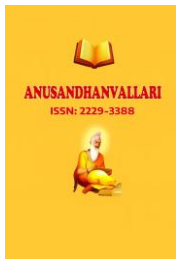
Artificial Intelligence has begun to significantly influence the investigation stage of criminal justice, which directly impacts trial procedures. Under the CrPC, 1973, investigation is predominantly human-driven, with police officers collecting evidence, recording statements, and filing charge sheets based on manual evaluation. While the CrPC permits scientific and forensic assistance, it does not structurally recognize algorithmic analysis or automated investigative tools. Consequently, investigative inefficiencies often translate into delayed trials and weak evidentiary foundations.

In contrast, the BNSS, 2023 reflects a paradigm shift by facilitating technologically enabled investigations. AI-powered tools such as facial recognition software, predictive crime mapping, and automated forensic analysis can accelerate evidence collection and verification. AI-assisted digital forensics enables faster analysis of electronic devices, emails, call records, and social media data, ensuring more accurate charge framing. This evolution enhances the quality of prosecution evidence, thereby strengthening the trial process and reducing adjournments caused by incomplete investigations.

AI and Digital Evidence Evaluation in Criminal Trials

The admissibility and evaluation of evidence form the backbone of criminal trials. Under CrPC, 1973, courts traditionally rely on oral testimony and documentary evidence, with electronic evidence being a later judicial addition through interpretations of the Indian Evidence Act. This approach often burdens courts with voluminous records and manual scrutiny, increasing the risk of human error.

The BNSS, 2023 implicitly acknowledges the dominance of digital evidence in contemporary crimes. AI can assist courts in sorting, classifying, and correlating electronic evidence, especially in complex cases involving cybercrime, financial fraud, and organized crime. Machine learning algorithms can identify patterns in transaction records or communication logs that may be otherwise overlooked. However, courts must ensure that AI-generated insights are treated as **assistive inputs** rather than determinative proof, preserving judicial discretion and procedural fairness.



Judicial Decision-Making and AI: Assistance vs. Automation

A critical concern surrounding AI in criminal trials is the extent to which it should influence judicial decision-making. CrPC, 1973 firmly anchors decision-making authority in judicial officers, emphasizing human reasoning, precedent, and discretion. Any technological assistance under this regime remains peripheral and administrative.

Under the BNSS, 2023, while the judicial role remains paramount, AI-based decision-support systems can enhance judicial efficiency. AI tools can provide judges with summarized precedents, comparable sentencing patterns, and statistical insights into similar cases. This does not replace judicial reasoning but augments it with data-driven perspectives. Nonetheless, excessive reliance on AI risks undermining judicial independence and may introduce algorithmic bias, necessitating strict ethical and procedural safeguards.

AI, Speedy Trial, and Procedural Justice

The constitutional mandate of a speedy trial under Article 21 of the Indian Constitution has long been challenged by systemic delays. CrPC, 1973, despite procedural safeguards, has struggled to ensure timely justice due to case backlogs and administrative inefficiencies. AI offers solutions by optimizing case scheduling, predicting trial durations, and managing judicial workloads.

The BNSS, 2023 aligns more closely with this objective by promoting streamlined procedures and technology-driven efficiency. AI-powered case management systems can reduce adjournments, automate summons, and track procedural compliance. By minimizing procedural delays, AI enhances access to justice and reinforces public confidence in the criminal justice system. However, speed must not compromise fairness; procedural shortcuts driven by AI must still respect due process and natural justice principles.

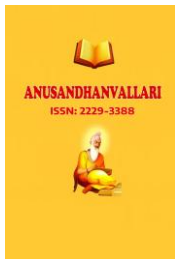
Ethical, Constitutional, and Human Rights Concerns

The integration of AI into criminal trial procedures raises serious ethical and constitutional questions. CrPC, 1973 implicitly safeguards personal liberty and due process by emphasizing judicial oversight. AI systems, if used without transparency, may conflict with constitutional principles such as equality before law and protection against arbitrary state action.

Under the BNSS, 2023, ethical governance of AI becomes crucial. Algorithmic bias, lack of explainability, and data privacy concerns pose risks to fair trials. For instance, predictive policing tools may disproportionately target marginalized communities, violating Article 14 of the Constitution. Therefore, AI deployment must be regulated through statutory guidelines, judicial review, and accountability mechanisms to ensure compatibility with fundamental rights.

Comparative Jurisprudential Lessons for India

International experiences demonstrate that AI's role in criminal trials must be carefully calibrated. Jurisdictions that treat AI as a supplementary tool rather than an authoritative decision-maker have achieved better outcomes. India, while adopting BNSS, 2023, can draw lessons from these systems by embedding AI within a rights-based framework. Judicial oversight, transparency mandates, and avenues for contesting AI-generated assessments are essential for maintaining procedural legitimacy.



AI and the Role of Legal Professionals

AI also reshapes the role of prosecutors, defense counsel, and judges. Under CrPC, 1973, legal professionals rely heavily on manual research and case preparation. AI-driven legal analytics can assist lawyers in identifying relevant precedents, assessing evidentiary strength, and preparing arguments more efficiently. Under BNSS, 2023, such tools can level the playing field, particularly for under-resourced defense counsel, thereby enhancing fairness in trials.

Comparative Analysis: CrPC, 1973 and BNSS, 2023

Procedural Structure and AI Compatibility

CrPC, 1973 standardized criminal procedures but was drafted in an era when digital evidence was minimal. Its provisions on evidence collection, witness examination, and trial advocacy are human-centric and presuppose manual record keeping. For example, sections governing witness testimony and cross-examination rely on physical presence and paper documentation, which can delay proceedings (Malik, 2007). AI integration under CrPC is *ad hoc* primarily through court-annexed digital case management systems introduced later.

BNSS, 2023, in contrast, emphasizes **digital first** approaches. It contemplates electronic processing of evidence, remote testimonies, and simplified procedural timelines. These elements facilitate AI integration. AI tools can index electronic evidence, transcribe witness statements through NLP, and assist in summarizing case records. For instance, automated generation of charge sheets from compiled digital evidence can reduce time spent on clerical tasks.

Evidence Handling and AI Enhancement

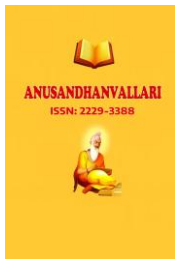
CrPC, 1973 treats evidence categories traditionally oral testimony and documentary evidence with strict formalities. Digital evidence is accommodated through later statutory interpretations and court directions. AI's role in evidence sorting under CrPC remains limited because evidentiary rules did not anticipate machine classification.

BNSS, 2023's structure supports **digital evidence** as primary evidence. This change enables AI tools to systematically process large datasets (e.g., CCTV footage, mobile data) and generate metadata for judicial review. However, AI outputs must be admissible under the evidentiary standards laid out in BNSS, requiring clear authentication protocols and safeguards to preserve integrity.

Trial Efficiency and AI-Derived Forecasting

One of CrPC, 1973's persistent challenges is trial delay. Manual docketing and sequential hearings often result in prolonged proceedings. While digitization initiatives have streamlined case tracking, AI's predictive capabilities were not structurally integrated.

Under BNSS, there is explicit encouragement for **expedited trials**, including timelines and simplified procedures. AI systems can forecast trial durations, identify bottlenecks, and prioritize hearings based on complexity enhancing judicial calendars. Additionally, AI can assist in plea negotiations by analysing case patterns historically to suggest optimal plea options, provided ethical guardrails are established to protect accused rights.



Rights Protection and AI Ethics

CrPC, 1973 contains robust protections for the accused right to counsel, fair hearing, and procedural safeguards. AI applications under the CrPC era risk inadvertent deprivation of rights if algorithmic outputs are treated as authoritative.

BNSS, 2023 embodies principles of fairness and victim participation. Any AI integration must reinforce, not replace, human discretion. Therefore, procedural reform must be paired with **ethical frameworks** ensuring transparency, explainability, and contestability of AI outputs.

International Perspectives

Globally, criminal justice systems grapple with integrating AI into trial procedures, balancing efficiency with fairness.

United States

In the U.S., AI is used in **risk assessment tools** for bail and sentencing. Systems like COMPAS (Correctional Offender Management Profiling for Alternative Sanctions) assess recidivism risk to aid judicial decisions. However, these tools have faced criticism for **racial bias** and opacity (Angwin et al., 2016). U.S. courts emphasize the need for transparency when AI influences judicial outcomes.

United Kingdom

The UK has piloted AI for **legal research and document review** in criminal and civil cases. Automated transcription tools assist courts with backlog reduction. Regulatory frameworks focus on **data protection**, ensuring AI systems comply with GDPR and procedural fairness.

Estonia

Estonia's e-Governance system is an example of advanced digital justice infrastructure. Courts use AI-assisted processes for case scheduling and online dispute resolution, demonstrating that a **digitally native ecosystem** can streamline procedural administration without compromising rights.

Canada and Australia

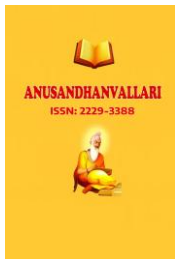
Both countries explore AI in legal analytics to support judges and prosecutors. Emphasis remains on **human oversight**, ensuring that AI augments rather than dictates judicial reasoning.

International Human Rights Law

The United Nations and European Court of Human Rights stress that AI in justice must uphold **due process, equality before the law, and non-discrimination**. AI tools must be transparent, auditable, and appealable ensuring individuals can challenge AI-generated assessments.

Conclusion

The evolution from CrPC, 1973 to BNSS, 2023 marks a transformative phase in Indian criminal procedure, one that aligns with the technological realities of the 21st century. Artificial Intelligence, when responsibly integrated, has the potential to address systemic inefficiencies, enhance evidentiary accuracy, and uphold the constitutional promise of timely justice. However, the legitimacy of AI in criminal trials depends on human oversight, ethical



governance, and constitutional fidelity. The future of criminal justice lies not in automated courts, but in intelligent systems that empower human judgment while preserving the rule of law. AI presents transformative possibilities for criminal trial procedures. In India, the transition from CrPC, 1973 to BNSS, 2023 offers fertile ground for AI integration particularly in evidence management, trial efficiency, and procedural transparency. However, embedding AI within criminal justice must be accompanied by ethical safeguards, procedural clarity, and protections against bias and opacity.

CrPC, 1973's legacy of procedural safeguards remains essential, AI under it serves primarily supportive roles. BNSS, 2023 provides structural flexibility that can meaningfully incorporate AI to enhance justice delivery. International experiences reveal that AI's benefits are maximized when coupled with human oversight, rights protection, and regulatory frameworks. India's challenge lies in adapting global lessons while safeguarding constitutional values of fairness, equality, and due process.

AI will not replace judicial reasoning but can significantly augment the procedural machinery if integrated responsibly. The future of criminal justice lies in **hybrid systems** where human judgment and machine efficiency co-exist to deliver just outcomes.

Future Scope

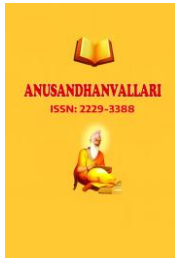
Future research and legal development should focus on:

1. **AI Governance Frameworks:** Establishing clear standards for explainability, auditability, and accountability of AI tools used in criminal trials.
2. **Judicial Training:** Equipping judicial officers with AI literacy to interpret, question, and validate AI outputs.
3. **Algorithmic Transparency:** Mandating documentation and open validation of AI models used in legal processes.
4. **Data Protection and Privacy:** Ensuring AI systems comply with privacy laws in processing sensitive criminal evidence.
5. **Ethical AI Standards:** Integrating AI ethics into procedural rules to prevent discrimination and bias.
6. **Localized AI Solutions:** Developing India-specific AI models that reflect its diverse socio-legal contexts.

These initiatives will be critical to ensure AI enhances justice without undermining legal protections or public trust.

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