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Artificial Intelligence and Criminal Justice Efficiency in Pakistan: A Critical Analysis of Machine Learning Applications for Case Backlog Reduction, Investigative Enhancement, and Fair Trial Safeguards

Syed Muhammad Najam Ameer Shah¹ Dr.Malik Imtiaz Ahmed²

¹ PhD Law, TIMES University, Multan, Punjab, Pakistan.

² Assistant Professor, TIMES University, Multan, Punjab, Pakistan.

Corresponding Author: Syed Muhammad Najam Ameer Shah, **Email:** najamameer@gcuf.edu.pk

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ABSTRACT

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Keywords

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Algorithmic Bias.

The criminal justice system in Pakistan still suffers from delays, disjointed records, poor investigation capabilities, low conviction rates, and significant case backlog. This study analyzes the potential of AI and ML in the criminal justice system and their implications for constitutional safeguards and the efficiency of the system. It examines potential applications in the areas of police investigation, assessment of evidence, management of prosecutions, judicial scheduling, legal research and integrated case tracking using a doctrinal, comparative and policy approach. Lessons are learnt from India, the United Kingdom, Estonia, China and European governance structure. The research shows potential for low-risk use cases, such as intelligent case management, digital evidence review, witness coordination and automated administrative support, to help decrease delays and increase institutional coordination. Bias, privacy, transparency, accountability, judicial independence and the right to a fair trial, however, are of serious concern with regard to predictive policing, risk scoring, facial recognition and automated adjudication. The paper calls for "phased implementation, human oversight, explainability, data protection legislation, independent audits and statutory regulation prior to large-scale adoption.



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1. Introduction

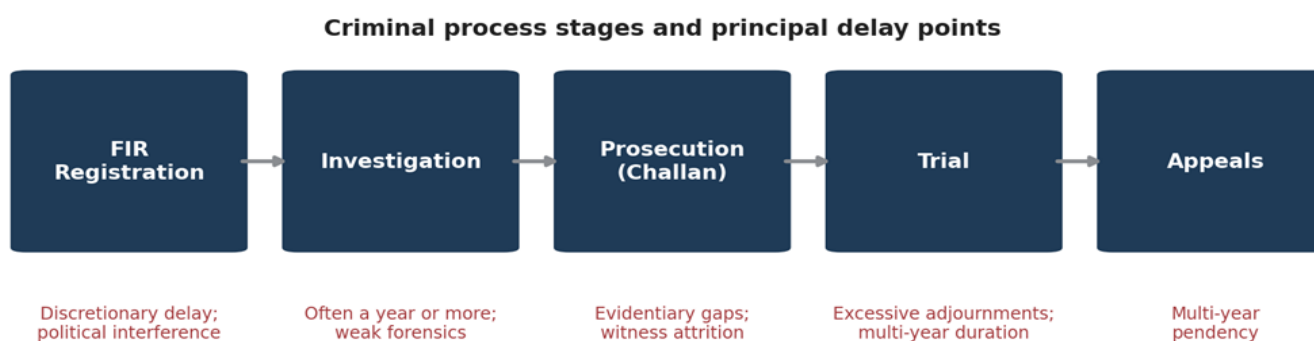
1.1. Background

The criminal justice system in Pakistan is under a huge institutional stress as a result of growing case backlog, prolonged delay, poor investigations and inefficacy of prosecution. The pendency of cases rose by 3.9% from July to December 2023 to around 2.26 million, according to data from the Law and Justice Commission of Pakistan (LJCP). Approximately 1.86 million of these cases (81.8%) are still pending before district courts, with almost 36% of them criminal cases (LJCP, 2024). These delays are more than merely an administrative problem; they affect constitutional guarantees of justice. *Ishfaq Ahmed v. Mushtaq Ahmed* (PLD 2025 SC 582) is the case involving the application of artificial intelligence in courts, where proceedings had been ongoing for seven years, highlighting the judicial delay caused by

other factors. Likewise, convictions are reportedly low (at 10 percent or below) which indicates poor investigation and prosecution systems (ICG, 2010).

Delay has significant constitutional issues. The Constitution of Pakistan has recognized the right to a fair trial and due process (Article 10A) and the right to cheap and prompt justice (Article 37(d)) for the people. Article 4 also enshrines citizens' right to protection of law. The Supreme Court has consistently held that unnecessary delay would be in breach of these principles as in the case of *Shahnaz Begum v Honourable Judges of High Court of Sind and Baluchistan* (PLD 1971 SC 677), it had held that delayed justice is denial of justice. These chokepoints are plotted in Figure 1 on the stages of the criminal process and the backlog for each tier and case type is broken out in Figure 2.

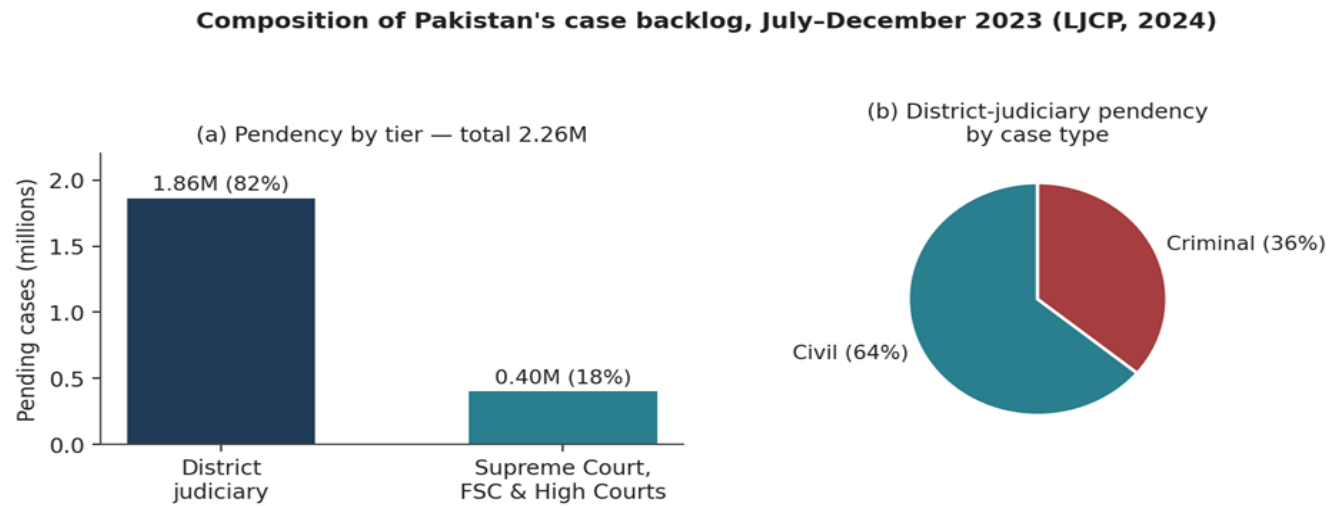
Figure 1: *Principal Delay Points Across the Stages of Pakistan's Criminal Process. Durations Are Indicative Averages Compiled from Law and Justice Commission Reporting and Secondary Literature*



The reasons for delay in the criminal justice system in Pakistan are known. However, investigations can consume more than a year from the time the FIR is registered to the challan is prepared because of limited resources of the police, poor forensic facilities and the problem with the practice of FIRs as provided under Section 173 of the Code of Criminal Procedure, 1898 (Hussain et al., 2026). The shortcomings of the prosecutors, specifically because they lack adequate evidence management, coordination with investigators, and witness issues, also lead to unsuccessful prosecutions (ICG, 2010). Limited judicial capacity, frequent adjournments of courts and lack of resources are also significant strains on the workload of courts.

In this context, Artificial Intelligence (AI) and Machine Learning (ML) are seen as the tools with the possibility of improving the efficiency in the criminal justice system. Pakistan already has digital bases with the establishment of e-Courts, video-link facilities, online FIR systems and biometric infrastructure by NADRA. In *Ishfaq Ahmed v. Mushtaq Ahmed* (PLD 2025 SC 582), the Supreme Court acknowledged AI as an assistive technology that can enhance judicial efficiency without compromising on the human element of decision making. Likewise, NJPMC guidelines call for transparency, accountability, and adherence to constitutional protections in using AI.

Figure 2: Composition of Pakistan's Case Backlog, July–December 2023: (a) Pendency by Tier of the Judiciary; (a) Civil–Criminal Split at The District Judiciary. Data from the Law and Justice Commission of Pakistan's Bi-Annual Report of Judicial Statistics (LJCP, 2024)



International experience, however, shows risks of the use of AI, such as algorithmic bias, lack of transparency and procedural unfairness (Angwin et al., 2016; Pasquale, 2015; Završnik, 2020). For this reason, the article investigates whether machine learning can help alleviate systemic delays in Pakistan's Criminal Justice system while ensuring fair trial protections. It considers and assesses viable applications of AI, cross-border lessons learnt and required regulation to avoid bias, lack of accountability, and infringement of rights. The study is innovative as it merges constitutional analysis, comparative experiences, and technology assessment to create a responsible AI framework suitable for Pakistan's criminal justice system.

2. Literature Review

Artificial Intelligence (AI) has become a major advancement in the access to justice (ATJ) movement generally and criminal justice in particular. Cappelletti & Garth (1978) identified subsequent waves of legal reform, namely that of legal aid, collective redress and informal dispute resolution, and more recently, Susskind (2019) referred to the fourth wave as technology-enabled justice that helps lower the costs and barriers in lawsuits. A procedural legitimacy view would mean that justice is not only a question of rightful results, it's a question of fair, accessible and transparent procedures as well (Habermas, 1996). Likewise, law-and-economics scholarship reveals that delays are extremely costly for litigants, witnesses and the State, and efficiency gains are

worth the reduction in legal rights as long as the resulting gains in efficiency are substantial (Posner, 2014). So, a criminal justice reform must be technologically driven in the direction of achieving just, speedy and accessible justice.

Yet, there are serious questions and concerns about technology and law in terms of accountability, transparency and human control. Susskind (2019) notes a difference between technologies that assist humans in making decisions and those that render them obsolete, pointing out that AI should aid in, but not supplant, judicial reasoning. In "The black box of the algorithmic system" (2015), Pasquale cautions against an algorithmic system that is opaque and lacks an explanation and contestation of the decisions made. Hildebrandt (2015) also states that the legal principle of contestability might be undermined by smart technologies because it may be difficult for people to challenge automated decisions. Zalneriute, Bennett Moses, and Williams (2019) highlight concerns with transparency, accountability, predictability, and equality, as the key elements of a rule-of-law framework for automated government decision making.

The experiences from other countries can offer insights into how AI can be used in criminal justice as well as its potential pitfalls. Predictive policing and risk assessment tools have sparked a large debate in the United States. An algorithmic risk assessment system called COMPAS showed issues of algorithmic bias, with black defendants

more likely to be misclassified as high risk than white defendants (Angwin et al., 2016). Chouldechova (2017) showed that it is not possible to obtain simultaneously fairness criteria that are competing when there are historical inequalities in the datasets. Likewise, there has been a spate of criticism regarding predictive policing programs like PredPol that can be used to perpetuate existing over-policing patterns (Richardson, Schultz, & Crawford, 2019). The examples illustrate the need for ongoing bias audit and transparency and human oversight for bias.

The potential for AI in court is more positive when it is used to assist with administrative tasks, not judicial decision-making. While Estonia's digital judiciary has successfully leveraged the automation of processes, its success relies on the development of suitable databases and interoperable databases (interoperability), as well as digital identity systems over the long term (Niiler, 2019; Sourdin, 2018). While China's "206 System" helps judges assess evidence for both the case and potential verdicts has been criticized for interference with judicial independence and over-reliance on algorithmic advice (Stern et al., 2021), other systems have been praised for their ability to increase speed and efficiency, thereby reducing the amount of time judges spend deliberating. Other systems, however, have been championed as ways to boost speed and efficiency, thus minimizing judge's deliberation time – but systems like China's "206 System" have been criticized for the potential for interference with judicial independence and over-reliance on algorithmic advice (Stern et al., 2021). Internationally, the European Commission for the Efficiency of Justice (CEPEJ) has drawn up ethical guidelines for judicial AI, such as the fundamental right to respect, non-discrimination, quality and security, transparency and user control (CEPEJ, 2018).

Facing these criminal justice issues in Pakistan highlights the need for a regulated use of AI. According to The Law and Justice Commission of Pakistan, there are huge pending cases in the district courts, especially these courts perform most of the pending cases (LJCP, 2024). A number of factors are cited as contributing to the delays in cases, with weak investigations, limited prosecutorial capacity and ineffective case-flow management being the primary causes cited in

institutional studies (Blue, Hoffman, & Berg, 2008; ICG, 2010). Pakistan has already taken steps towards the digital transformation of its judiciary, such as the establishment of e-courts, judicial automation, online complaint systems, and digital forensic infrastructure. The latest judicial innovations, such as the Supreme Court accepting AI as a tool, not a replacement, to judicial reasoning in the case of *Ishfaq Ahmed v Mushtaq Ahmed* (PLD 2025 SC 582), reflect a new human-centred approach that has been promoted by NJPMC guidelines (2026). But there are many lacunas in research which needs to be addressed in the context of comprehensive integration of AI into Pakistan's criminal justice system, comparative adaptation of international models, and legal framework that can be established to ensure the balance between efficiency and constitutional safeguards.

3. Research Methodology

The study employs a mixed doctrinal-comparative research methodology to analyze three aspects of the integration of AI in the criminal justice framework, i.e., the legal, institutional and comparative perspective. The doctrinal analysis involves the constitution provisions (Articles 4, 9, 10A, 14, 25, 37(d), and 175) and the relevant laws including Code of Criminal Procedure 1898, Qanun-e-Shahadat Order 1984, Police Order 2002, NADRA Ordinance 2000, and Electronic Transactions Ordinance 2002. Judicial precedents on the fair trial, speedy trial, privacy and electronic evidence are explored to identify constitutional limits and opportunities for reform. Comparative analysis is done on India, United Kingdom, European Union, Estonia and China with a functional approach that involves the transferability of lessons, challenges of implementation and rights implications. Policy documents are also examined such as CEPEJ principles, OECD AI principles, EU AI Act, UN Sustainable Development Goal 16, and judicial technology policy in Pakistan. The study relies on data from LJCP, the police, the prosecution and international agencies. An analytical framework is used to evaluate AI applications in terms of technical feasibility, legal permissibility, cost benefit potential and impact on rights. Challenges include the variability in data availability, lack of stakeholder interviews with primary stakeholders, and the evolving nature of AI technologies.

(a) AI applications to specific bottlenecks

This section breaks down the three main clusters of bottlenecks identified in Section 1 – investigation, prosecution and adjudication – and shows how candidate AI applications relate to

each of these clusters, before considering two cross-cutting applications. The results of the evaluation of each application to the four criteria mentioned in Section 3.3.2 are summarised in Figure 4 and detailed in tabular form in Table 1 (as a bottleneck matrix).

Figure 4: *AI Application Assessment Matrix. Scores Are the Authors' Qualitative Assessments On a Five-Point Scale Derived from The Criteria in Section 3.3.2; For The Rights-Risk Column, Higher Scores Denote Lower Risk*

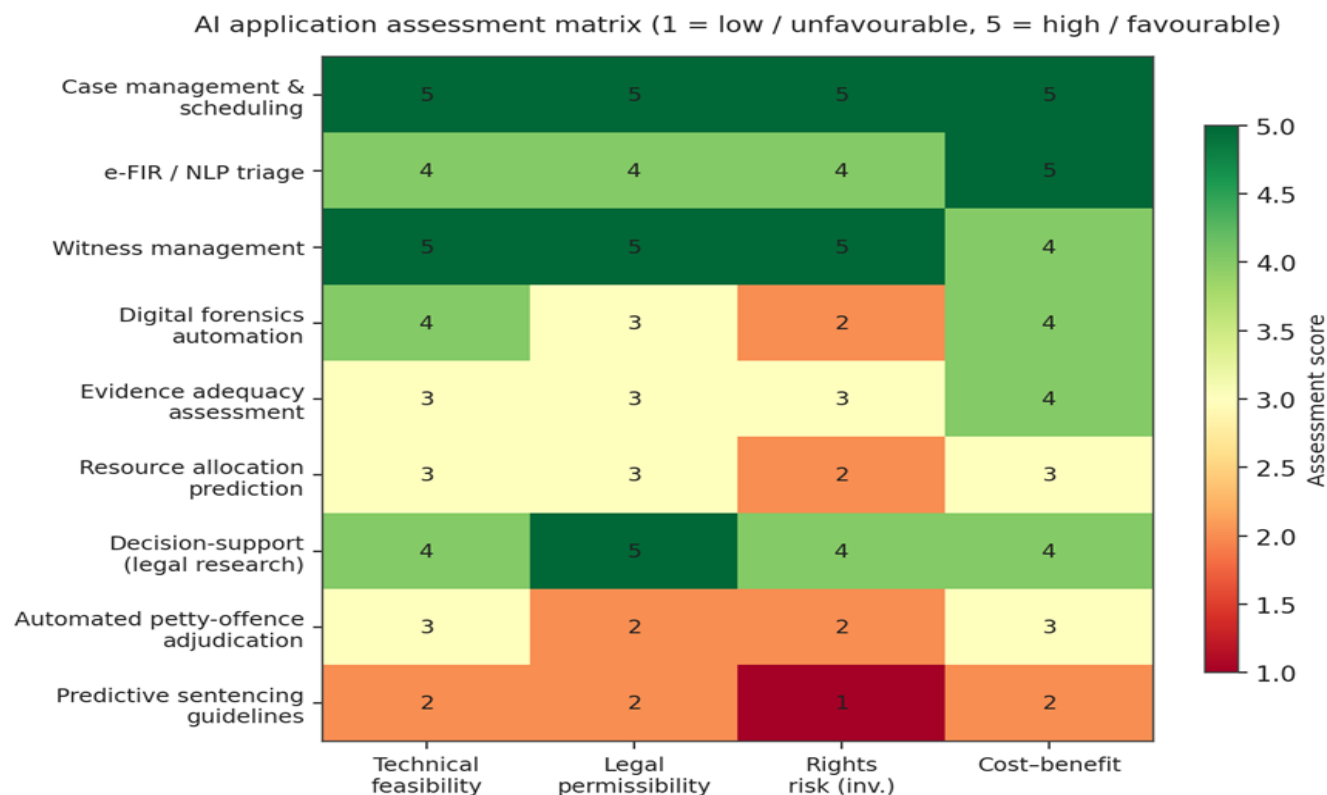


Table 1: *Bottleneck Identification Matrix: Process Stages, Delay Drivers, and AI Applicability*

Process Stage	Principal delay drivers	Candidate AI application	Feasibility
FIR Registration	Discretionary refusal; political interference; manual intake	NLP-based e-FIR triage and classification	High
Investigation	Year-plus duration; weak forensics; poor resource matching	Forensic automation; predictive resource allocation	Medium
Prosecution	Evidentiary gaps in challans; witness attrition	Evidence-adequacy assessment; intelligent witness management	Medium–High
Trial	Excessive adjournments; scheduling conflicts; administrative burden	Predictive scheduling; automated routine orders; decision-support	High
Appeals	Multi-year pendency; research burden	AI-assisted legal research; case summarisation	High

4. Analysis and Results

4.1 Investigation Stage Enhancement

Investigation is one of the most important reasons for the delay in the criminal justice system in Pakistan. Even though the CrPC 1898 mandates FIR registration, it is not observed as there is discretion in practice, political manipulation, institutional pressure etc. which causes delay. Delays in processing DNA and digital evidence, insufficiently trained investigation officers and the heavy caseloads have resulted in investigations to take more than a year from the time of FIR lodging till the submission of challan under Section 173 CrPC. In addition, because there is no universally accepted protocol, the digital evidence is not always collected, preserved, and presented, making it not always admissible and effective in subsequent proceedings.

AI can help overcome these challenges by automating the process of FIR registration and triage systems. Natural Language Processing (NLP) tools can classify complaints, determine whether the offence is cognisable or not, route the case to the police station and assign an urgency score to the complaint. AI-powered intake can complement the existing online FIR system, like the one already implemented by Punjab Police, by cutting down on discretionary delays, establishing digital records, and ensuring data is more accessible. For accountability reasons and to meet Section 154 CrPC, however, all automated classifications must be subject to review and confirmation by a police officer. Further, electronic FIRs have to comply with the requirements of Article 164 of Qanun-e-Shahadat Order 1984 and the Electronic Transactions Ordinance 2002.

Machine-learning-driven resource allocation will help further optimise investigative efficiency by predicting the complexity of a case, required skills and resources. But reliable and standard data is essential to successful implementation. If not subject to a bias assessment, poor quality historical police records can perpetuate the same discriminatory practices. Thus, the use of AI also needs to be tied to data standardization and ongoing auditing processes.

Digital forensics is another promising field that can be aided by AI, such as analyzing images and

videos, extracting metadata, analyzing financial transactions, and evaluating call-detail-record data. Pakistan has robust technical infrastructure in the form of NADRA and needs to have robust legal safeguards. Article 14 guarantees the right to privacy, which means that access to personal information must only be possible by means of express legal permission and supervision.

4.2 Prosecution Stage Optimisation

Weak prosecution, one of the key factors, plays a huge role in Pakistan's conviction rate. Typical issues are incomplete challans, inadequate cooperation between investigators and prosecutors, loss of evidence and absence of witnesses. Pre-trial quality control can be achieved through AI to ensure that there are no missing forensic reports, witness statements or chain of custody issues before a case goes to trial. These systems are required to be explainable, advisory and in accordance with evidentiary requirements of the Qanun-e-Shahadat Order 1984.

Witness management can be enhanced using AI tools to schedule witness appearances, provide digital reminders and facilitate coordination of transport, witness protection etc. Witnesses are a significant reason for adjournments, so increased attendance will help to decrease delays. But the information of the witnesses must be well guarded by the use of encryption and proper privacy measures.

Prosecution decision support systems could be helpful for prioritizing cases based on evidence strength, and/or public-interest considerations. These systems, however, have to be used with caution, as they can affect prosecutorial decisions based on algorithmic recommendations. The accountability is essential and can be maintained by ensuring transparency, explainability, and documentation of human reasoning.

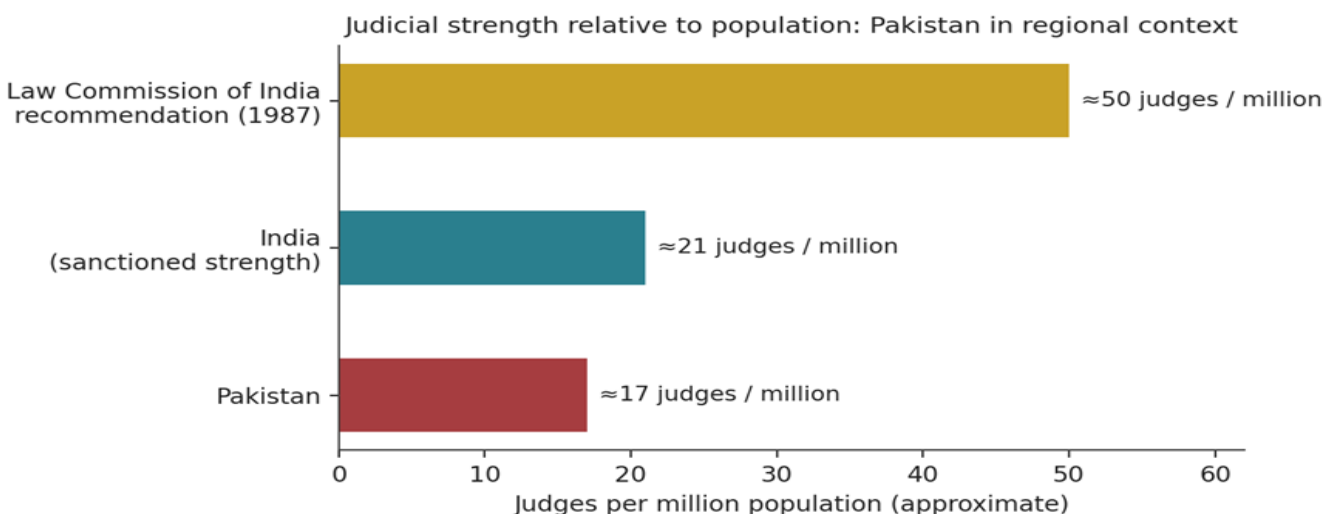
4.3 Judicial Adjudication Acceleration

Pakistan is grappling with significant issues at the adjudication phase, such as the backlog of cases of around 2.26 million, inadequate judicial strength, and a pattern of frequent adjournments (LJCP, 2024). Judges spend a lot of time on administrative duties, such as dealing with routine orders and the management of cause-lists which take away time for substantive judicial work. The

use of AI tools for case management, scheduling, and drafting of standard procedural documents could streamline administrative tasks and free up judges' time for more substantive roles. AI can help automate routine administrative tasks, such as case management, scheduling, and preparation

of procedural documents, which can help reduce workload and administrative burden on judges. But the role of AI should be complementary, not supplanting, and human judges should continue to have the final say and make legal decisions.

Figure 3: *Judicial Strength Per Million Populations: Pakistan (derived from LJCP-reported Judicial Strength of Approximately 4,000 Judges) Against India's Sanctioned Strength and The Law Commission of India's (1987) Benchmark of Fifty Judges Per Million. Values are Approximate.*



4.3.2 AI Solutions

The use of AI in Pakistani courts should be for the purpose of providing support, not taking the place of human judgment. By alerting on possible conflicts between parties, witnesses, or attorneys, intelligent case management can enhance scheduling, anticipate delays, and maximize court resources. Routine procedural orders such as summons and adjournments can be automated without losing judges' review and signing powers. While the final verdict on guilt, freedom, and sentencing will still be left to the judge, AI tools can be used to assist with legal research, looking for precedents, or in other ways to help make sure sentences are consistent. Minor regulatory violations with fixed penalties can be attempted to be automated, but must be subject to mandatory human review. The applications are required to respect the constitutional safeguards, including those provided by Article 10A of the Constitution of the Kingdom of Nepal on the right to fair trial, and Article 175 of the Constitution on the independence of judiciary. Being transparent, having audit trails, having human oversight, disclosing the use of AI and having the right to challenge algorithmic output are all requirements for a lawful implementation.

4.4 Cross-Cutting Applications

4.4.1 An Integrated Criminal Justice Database is a Database System That Combines Criminal Data with Various Other Information Sources

Police, prosecutors, court and prisons in Pakistan have their own record systems, many of which are non-interoperable and where data is duplicated at every institutional interface resulting in expected delays and errors. An integrated criminal justice system, based on the Indian ICJS model, which is a federated data architecture with machine-learning analytics to reveal systemic patterns in delay causes, conviction rates by offence type, and the resource gaps, will turn the criminal process into an observable system that could be amenable to evidence-based reform. The legal foundation needs to be updated – the colonial era CrPC needs to be amended so as to introduce the concept of electronic record keeping and interoperability standards – and the constitutional foundation needs to be introduced, in the manner outlined in Section 6.3.2., as a data-protection regime. The governance model needs to be federally coordinated, but provincially owned, as criminal justice is a very significant provincial matter post

the Eighteenth Amendment (Section 7.2.2).

4.4.2 Detection and Mitigation of Algorithm Bias

All the above applications have the inherent biases of their training data. The salient risks in Pakistan are that religious minorities are over-represented in certain categories of offences, for example, in blasphemy cases; and there are significant differences between conflict affected and metropolitan areas; any models based on such data will, if unchecked, replicate and validate such patterns. Mitigation needs to be proactive such as fairness constraints in model building,

Table 2: Comparative Summary of AI Deployment in Criminal Justice Systems

Jurisdiction	Principal system(s)	Key strengths	Key weaknesses / risks	Principal lesson for Pakistan
India	Interoperable Criminal Justice System (ICJS)	Interoperability across 15,000+ institutions; litigant-facing transparency	Digital divide; privacy concerns post-Puttaswamy; uneven adoption	Phased, federally coordinated but provincially owned rollout
United Kingdom	CPS / police technology-assisted disclosure review	Large efficiency gains in evidence review	False negatives; appellate criticism; over-reliance risk	Hybrid human–AI review; AI augments, never replaces
European Union	CEPEJ Ethical Charter; EU AI Act	Mature rights-protective normative framework	Framework, not deployment; enforcement still developing	Adopt adapted CEPEJ principles; codify in statute
Estonia	E-judiciary; automated small-claims disposition	Backlog clearance in routine matters; digital-identity foundation	Limited to standardised disputes; legitimacy hesitancy	Automation viable only for narrow, non-liberty case classes
China	Intelligent courts; Shanghai '206 System'	Scale and technical sophistication	Opacity; judicial pressure; surveillance integration; rights deficits	Cautionary: efficiency cannot justify constitutional compromise

5.1. India: The Interoperable Criminal Justice System

The international experiences have lessons to offer Pakistan on how AI is implemented in criminal justice and the opportunities, constraints, and governance structures involved in AI adoption. The Integrated Criminal Justice System

disaggregation of outputs in the model, and corrective retraining, and institutionalised, e.g. by making annual algorithmic impact assessments mandatory, as in the EU AI Act (Regulation (EU) 2024/1689) for high-risk systems. This function is a Statutory Oversight and Inspection Body as per Section 6.3.1.

5. Comparative Analysis

This section compares five jurisdictions to the framework outlined in Section 3.3.3 regarding their success, failures and transferability lessons. A comparison is summarised in table 2.

(ICJS) of India is one of the most relevant comparative systems as it shares its historical legal framework, institutional issues and criminal justice systems. ICJS is a Central Sector Scheme of the Ministry of Home Affairs (MHA) and conceptualized by e-Committee of the Supreme Court of India, which brings together five pillars of Criminal Justice namely police (Crime and

Criminal Tracking Network and Systems (CCTNS)), court (e-Courts), prosecution (e-Prosecution), prisons (e-Prisons), and forensic laboratories (MHA, 2022). The aim is to make a continuous digital record of FIR till investigation, trial and incarceration. Phase I (2018-2022) was directed at enhancing individual systems and Phase II (2022-2026) was directed at the principle of “one data, one entry” facilitating information sharing among systems and enhancing criminal data analysis (MHA, 2022). While ICJS has made improvements in coordination, minimized duplication and provided increased access to case information, problems persist such as issues regarding privacy after Justice K.S. Puttaswamy v. Union of India ((2017) 10 SCC 1); reliance on paper-based procedures is ongoing; and digitising inefficient procedures may result in greater inefficiency. The key take-aways for Pakistan are the need for federal–provincial coordination, a phased approach of implementation, institutional capacity building, and a comprehensive law on data protection.

5.2. The United Kingdom: The Automation and Disclosure of Prosecutors

The UK gives valuable insights into prosecution and evidence handling with the support of AI. Modern investigations produce vast amounts of data, such as device extractions, communications and CCTV footage and this can be very challenging to manually review. Technology-assisted review (TAR) has been introduced to help meet this challenge: the use of technology to carry out the initial relevance screening and classification of documents; and the final decisions left to the prosecutors. While TAR has managed to substantially shorten the time for reviews, there are some issues with false negatives, in which important evidence might not be detected by algorithms. In 2018, the Attorney General published an update on their disclosure review, which highlighted that as an aid to prosecutive tasks, AI use should not be at the expense of human discretion, and that it must be effectively managed, transparent and professionally accountable (AGO, 2018). The concept is relevant to Pakistan, where the integration of AI technologies can further improve institutional efficiency, maintaining human accountability.

5.3 The CEPEJ Ethical Charter and the AI Act

The EU is the most detailed and developed ethical and regulatory body related to the judicial use of AI. The CEPEJ ethical charter establishes five principles: respect for fundamental rights, non-discrimination, quality and security of data, transparency/explainability, and human control over decisions taken by algorithms (CEPEJ, 2018). These principles create structures that ensure that AI systems are comprehensible, interpretable and controllable by human decision makers. The EU Artificial Intelligence Act (Regulation (EU) 2024/1689) also considers AI systems used in law enforcement and judicial administration to be high-risk systems to which strict risk management, data governance, human oversight and compliance testing must apply. The principles are very similar to the requirements of the constitution of Pakistan such as the guarantee of the fair trial under article 10A, equality principle under article 25 and the protection of judicial independence under article 175.

5.4. Estonia: E-Judiciary and Automated Small Claims

The advanced digital courts are a good example of how digital justice can be implemented in Estonia. For standardized civil claims involving low stakes, the country has tried out algorithmic decision making, whilst simultaneously retaining the option of humans to review cases (Niiler, 2019). The Estonian example demonstrates the benefits of using automation for increased efficiency and for judges to concentrate on more complex issues. But these need to be prevalent in Pakistan, including having a universal digital identity, interoperable databases, and high levels of digital literacy, in order for it to be successful. However, Estonia's model can be applied to criminal trials relating to some regulatory issues, but not to those involving liberty and fundamental rights (Sourdin, 2018).

5.5. Intelligent Courts in China as a Cautionary Tale

China is a cautionary tale in the over-dependence on AI in criminal justice. Automated transcription, facial recognition, evidence assessment and even the Shanghai “206 System,” which rates the sufficiency of evidence and recommends verdicts and sentences, are all features of the Chinese

judicial systems. But scholars have noted issues of lack of transparency, limited possibilities to question the logic of algorithms, pressure on judges by the institutions to agree with the AI's recommendations, and connections between criminal justice AI and other surveillance systems (Stern et al., 2021). The key takeaway for Pakistan is the need for transparency, accountability, and regulatory approval within the realm of AI. Efficiency does not come at the expense of constitutional freedoms and AI use should be driven by democratic laws, not administration.

6. Legal-Constitutional Framework Analysis

6.1 Constitutional Foundations and Constraints

6.1.1 The right to a speedy and fair trial (Article 10A)

Article 10A is a sword and shield in this analysis. As sword, it provides constitutional support to the efficiency demand: in *Liaquat Hussain v. Federation of Pakistan* (PLD 1999 SC 504) the Supreme Court had observed that the right to speedy trial is an intrinsic part of the right to speedy trial and in *Shahnaz Begum* (PLD 1971 SC 677) onwards, the Supreme Court has ruled that the structural delay is itself a form of injustice. Technologies that have proven to reduce delay thus do not just coexist with Article 10A; rather they are useful for its implementation — which was expressly stated by the Supreme Court in *Ishfaq Ahmed v. Mushtaq Ahmed* (PLD 2025 SC 582) in the context of a seven-year-old dispute. But Article 10A is a shield, which limits how that efficiency can be achieved, and where *Ishfaq Ahmed* again reminds readers of the potential pitfalls of AI hallucination, bias and over-reliance, and the importance of judicial reasoning and the need to not replace it with AI. As indicated in the text, and the structure, there are three constraints. There is an assumption of human adjudication in the guarantee of determination 'in accordance with law' before an independent tribunal, in contested criminal cases the judicial function of finding the facts on contested evidence and applying the law with reasons cannot be delegated to a machine. But the fair-trial right to know and answer the case also suggests that opacity of a system in any way affecting the outcome of a trial will be constitutionally suspect. The right to be heard also means that the steps of the procedure, where they

are carried out with the help of an AI system, have to be understandable and subject of a challenge, and not incomprehensible.

6.1.2 Article 175: Judicial Independence

Article 175 entrusts judicial power to the courts and together with the separation-of-powers jurisprudence, guarantees institutional independence of the judiciary from the executive. The problem with the AI is subtle: when the algorithms in place in courts are 'bought, set up and updated' by executive agencies for example, a data authority headed by the interior ministry the executive influence seeps in, whatever the formal status of the judge. The safeguard is institutional: The judiciary must be the body to control the selection, customisation, auditing and deployment of AI in courts, in particular through the Supreme Court, the High Courts and their administrative committees and not the justice sector, which is to be governed by AI, by an executive ministry. The principle is already reflected in the institutional setup which has led to the formulation of the national AI guidelines 2026: the guidelines were formulated by a consultative committee, headed by a Supreme Court judge and comprising judges from all High Courts and the guidelines explicitly recognise the administrative and judicial autonomy of each High Court in implementation (NJPMC, 2026). The system is under the user's control and the user is the judge, this is the domestic translation of CEPEJ Principle 5.

The dignity and right to private life are afforded the protection of Article 14 of the Convention.

Watan Party case (PLD 2006 SC 697) and the dignity jurisprudence of the Supreme Court of Pakistan has given the idea of informational privacy a strong base as protected by the ambit of Article 14, the dignity of man and privacy of home as protected by the provision, subject to the law; the Indian Supreme Court's development of the concept of informational self-determination in *Puttaswamy* (2017) 10 SCC 1) is highly persuasive in this regard, given the common constitutional history. Criminal-justice AI touches every aspect of Article 14: databases are integrated, combining biometrics, criminal records, communications metadata and financial data; predictive analytics can be used to monitor certain people in advance, who have been given a 'high risk' score; and centralised databases are

also a target for theft.

Enact comprehensive data-protection legislation prior to large scale deployment, based on GDPR and the Digital Personal Data Protection Act 2023 (Section 6.3.2), India.

- Limits on use: the use of criminal-justice data is limited to specific criminal-justice uses, and it is prohibited by law to use it for any purpose other than that.
- The principles of data minimisation and retention limits including narrow, judicially supervised, exceptions for data relating to acquitted persons.
- Security standards: 72-hour breach notification, role-based access and encryption

at rest and in transit.

- Analytic access to personal data must have a judicial warrant, in the same way as U.S. law on warrant requirement for Watan Party.

6.2 Statutory Framework Adaptations

Abolition of zamindari system on the basis of the 1949 Zamindari Abolition Bill.

The assumptions of the CrPC are paper-centric, and are outmoded not only by the advent of computing, but by the ubiquity of the typewriter, and therefore do not work for the majority of Section 4 applications at scale without modifications. Table 3 lists the main changes proposed.

Table 3: Principal proposed amendments to the Code of Criminal Procedure 1898

Provision	Amendment	Purpose
s. 2 (Definitions)	Insert definitions of 'electronic record', 'digital evidence', 'automated system', and 'algorithmic decision-support'	Interpretive foundation for all subsequent provisions
s. 154 (FIR)	Permit electronic FIR submission and automated preliminary classification, subject to confirmation by a police officer	Lawful basis for e-FIR and NLP triage (Section 4.1.2)
s. 173 (Report of investigation)	Permit digital challan submission; prescribe authentication standards for digital evidence	Digitised prosecution intake with evidentiary integrity
New s. 173-A	Authorise AI-assisted investigation tools subject to judicial oversight, logging, and the prohibition on sole algorithmic reliance	Delimited authorisation of investigative analytics
s. 244 and cognate trial provisions	Permit AI-generated case summaries and automated drafting of routine procedural orders, subject to judicial approval	Lawful basis for court-side automation (Section 4.3.2)
New s. 561-B (AI governance)	Enact principles of transparency, explainability, human override, and bias auditing; delegate rule-making to the Supreme Court	Anchor governance principles in the procedural code

6.2.2 Qanun-e-Shahadat Order 1984

Article 164 of the Qanun-e-Shahadat Order makes electronic records admissible, yet doesn't include any evidence standards for evidence that is the product of algorithmic analysis. There is a proposal to add a new Article 164-A, which provides that any evidence resulting from the use

of AI must be subject to the following: disclosure of the identity and function of the algorithm; expert testimony on the methodology, validation and error rate; providing accuracy and validation data; and giving the other party a meaningful opportunity to challenge the output (including by its own expert). Integrity is complemented by an accompanying concept of algorithmic chain of

custody – certification of the model version, training-data provenance and parameters used in the specific analysis. Clarify article 59 (expert opinion) to make it explicit that the AI analysis is expert opinion and therefore requires a human expert sponsor, and possibly judge-led creation of judicial-notice rules for well-established methodologies, but specific validation of particular implementations.

6.2.3 Police Order 2002

The Police Order 2002 should be updated to explicitly permit the use of technology-assisted investigation, and to include limits, such as an express ban on relying solely on predictive analytics for stop, search or arrest, an approval process for the use of predictive analytics, requiring annual reporting to the provincial assemblies, and requiring a quarterly review of demographic bias.

6.3 Proposed New Legislation

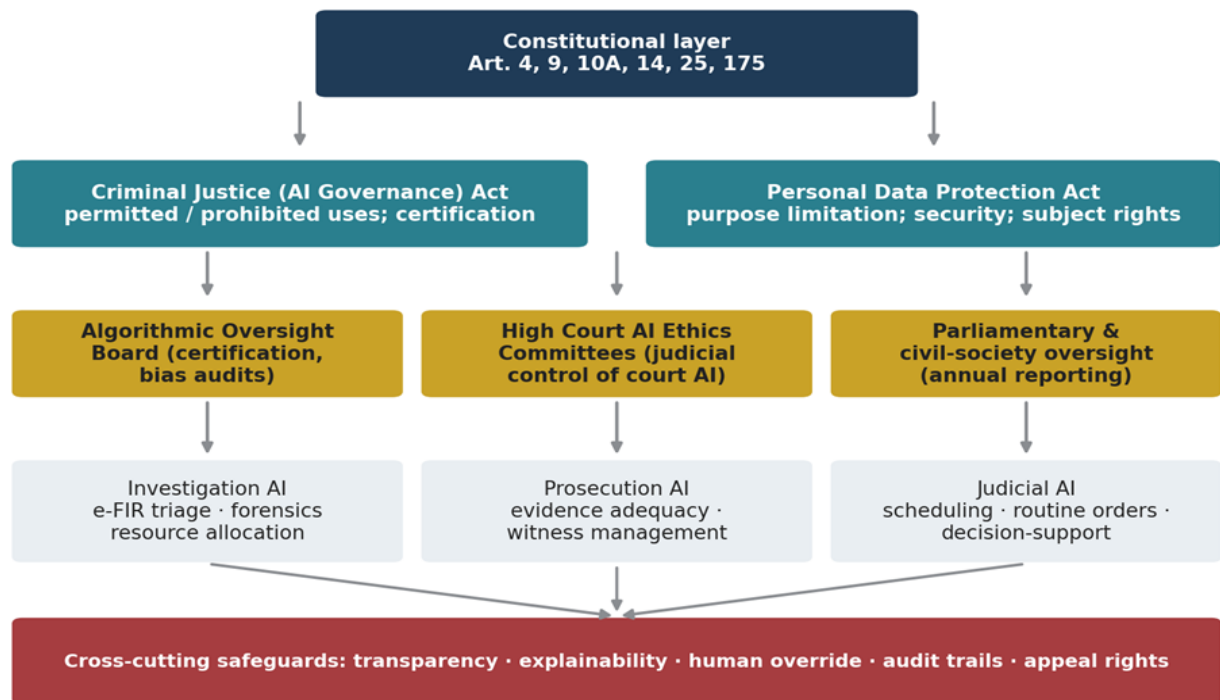
This is a proposal for a Criminal Justice (Artificial Intelligence Governance) Act.

The NJPMC's 2026 guidelines provide a principled soft-law basis (human-centric use, ethical and transparent deployment, safeguards against bias and explainability (NJPMC, 2026)) but the guidelines do not bind the police, prosecution services, vendors and/or data controllers of the systems to which this article applies and do not establish enforceable rights and remedies or a certification regime. The main feature of the proposed framework is thus special primary legislation that codifies and extends them, the architecture of which is summarised in Figure 5. Part I would provide definitions of key terms such as “artificial intelligence,” “automated decision-making,” “algorithmic bias,” and

“explainability” and the Act's two-fold goal of efficiency and rights protection. Part II would specify what applications are allowed (as mentioned in Section 4) investigation support, prosecution assistance and judicial decision-support, but it would say that determined automation of guilt, automation of sentencing without human judgment, and predictive profiling for discriminatory purposes is absolutely forbidden. Part III would set up a multi-stakeholder pre-deployment certification Algorithmic Oversight Board, with judges nominated by the Chief Justice; advocates nominated by the Bar Councils; a technologist; a civil-society member; and an academic, and would provide the Board with the functions of pre-deployment certification, impact assessment and investigation of complaints, while introducing a vendor-certification regime with a demonstrated record of accuracy, fairness and security. Part IV would implement transparency and accountability requirements, including: requirement to notify parties when AI is used in their case, the right to a human-readable explanation for any AI recommendation, comprehensive audit trails would be kept for appeal, and annual public reports of AI usage, accuracy and findings of bias audit. Part V would impose data-protection requirements – purpose limitation, minimisation, retention restrictions, security requirements, notice of breach and the rights of data subjects, such as post-acquittal deletion on the processing of data in the context of the criminal justice. Part VI would include enforcement complaints to the Board, judicial review under the jurisdiction of the constitutional courts, damages for infringement of rights through algorithmic error, and criminal penalties for the illegal deployment and data breach.

Figure 5: *Proposed Rights-protective Governance Architecture: Constitutional Norms Flow Through Two Statutes into Oversight Institutions That Govern the Three Operational Domains, Bound by Cross-cutting Safeguards*

Proposed rights-protective AI governance architecture for Pakistan's criminal justice system



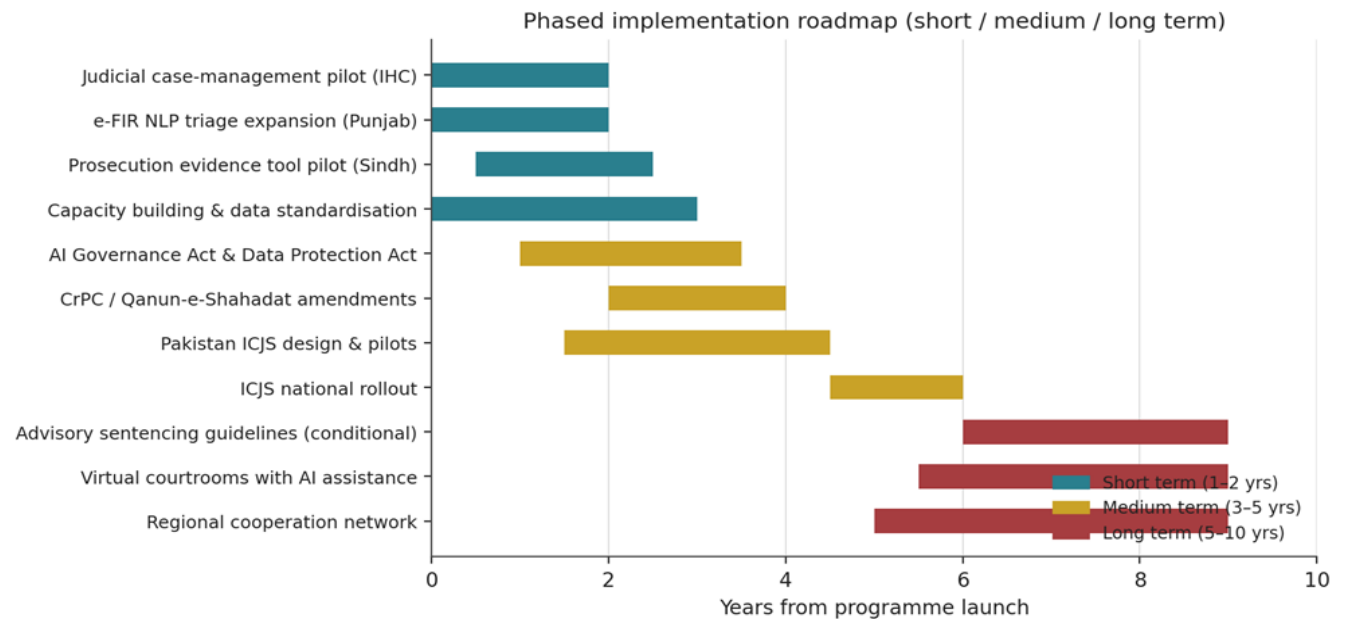
6.3.2 A Personal Data Protection Act

By design, AI in criminal justice relies on data and for decades, Pakistan has been working on data-protection laws, but they still have not been enacted. Enactment is key, therefore, for all the points that are suggested in this article. The criminal-justice-relevant ones are: a lawful-basis regime under which law-enforcement processing is only allowed on the basis of a law and with safeguards for those concerned; improvements in the protection of special category data, such as biometrics or religious affiliation, including judicial supervision on access; limitations on solely automated decisions that have significant effects on the people concerned, with human oversight on important decisions like bails; and

enforceable rights of data subjects, including access, which are vital for data subjects who want to correct erroneous criminal data that would be propagated in every algorithm they were trained on. The law-enforcement counterpart of the GDPR – Directive (EU) 2016/680 – provides models for India's Digital Personal Data Protection Act 2023.

7. Recommendations and Policy Framework

This section turns the above analysis into a step-by-step, phased roadmap (short-term – one to two years; medium-term – three to five years; and a conditional long-term – five to ten years) and then into cross-cutting risk-mitigation guardrails. The roadmap is shown in the graph below, in Figure 6.

Figure 6: Phased Implementation Roadmap. Long-term Applications Are Conditional on Demonstrated Success and Mature Governance in Earlier Phases

7.1 Short-Term Interventions (Years 1–2)

The proposed AI implementation roadmap is first to be three measurable projects of judicial case management, classification of FIR using NLP and assessment of prosecution evidence. These pilots will assess the efficiency, accuracy, and user satisfaction before wider adoption. There is a need for parallel institutional capacity development, by providing training to judges in AI, establishing provincial technology units in police and prosecution offices, and providing equal access to AI legal tools for defence attorneys. Additionally, the successful implementation of AI for sustainable purposes will depend on robust data infrastructure, such as the national criminal justice data standards, interoperability of criminal justice systems, and the gradual digitization of historical data for consistent and fair AI performance.

7.2 Medium-Term Reforms (Years 3–5)

The implementation roadmap calls for a comprehensive legal and institutional framework to enable responsible use of AI in Pakistan's criminal justice system. The following are important priorities: enacting a Criminal Justice (AI Governance) Act; enacting a Personal Data Protection Act; and making critical amendments to criminal procedure and evidence laws. The Pakistan Integrated Criminal Justice System should be implemented in a phased manner starting with the federal–provincial coordination,

pilot projects in high-readiness jurisdictions, and then to a national roll out. There should be an independent Algorithmic Oversight Board and Algorithmic High Court Ethics Committees to certify, audit, keep accurate records, and provide ethical oversight for systems using AI.

7.3 Long-Term Vision (Years 5–10)

Adopting advanced uses of AI in the Pakistani criminal justice process must be done after institutionalization and good governance. If implemented, predictive sentencing guidelines should be advisory, open, and explainable and leave room for judges' discretion, with the obligation to provide a reason for each sentence that deviates from the guidance. Likewise, AI-powered virtual courts could improve access to justice by providing real-time court transcription, digital evidence management and legal research assistance, especially for those living in regions without easy access to justice, and, in the case of minor offences, restorative justice matching systems could enable alternative dispute resolution in cases where constitutionally allowed. By leveraging shared research, collaborative pilots, and harmonized practices, supported by international organizations, regional cooperation can enhance the development of responsible AI in South Asia. But AI is not a panacea for structural reforms because it will not fix a lack of resources, institutions or governance. In addition, hybrid service models and digital literacy initiatives and

support to Urdu and regional languages should be developed to avoid digital divide. The four elements of professional training, independent decision-making by agencies, documentation and accountability of officials and technology providers are crucial to effective mitigations against automation bias. Last but not least, strict control measures are required to stop mission creep and surveillance risks from mission creep, the possibility of lawful violation, parliamentary supervision, and the monitoring by independent civil society institutions.

8. Conclusion

8.1 Summary of Key Findings

The aim of this article was to explore the possibility of decreasing systemic delay in the criminal justice system in Pakistan without compromising on constitutional rights and principles of fair trial, using machine learning. The results show that there is potential for significant efficiencies to be realised, provided that governance, legal protection and institutional capacity are put in place first.

The criminal justice system in Pakistan is plagued with several challenges, including a backlog of pending cases (around 2.26 million), low conviction rates, lengthy investigations, inadequate evidence management, judicial shortages, and regular adjournments. The study categorized proposed technologies into 3 groups. The case management system, e-FIR triage, witness-management systems and AI-assisted legal research are some apps that are high on feasibility and can be piloted immediately as they pose relatively lesser constitutional challenge.

Applications with medium feasibility include predictive resource allocation, digital-forensics automation and prosecution decision-support, which demand reliable data, bias audits, transparency and good oversight. Low-feasibility applications such as predictive sentencing and automated adjudication are problematic under Articles 10A and 175 and should not be implemented to determine guilt, liberty or punishment.

Comparative analysis highlighted the importance of interoperability and federal coordination in India, the utility of a system of hybrid human–AI review in the United Kingdom, the transferable risk-based governance principles in the European Union, the value and infrastructural requirements of narrow automation in Estonia, and the dangers of opacity, surveillance, and algorithmic interference with judicial independence in China.

The research finds that machine learning can only help to mitigate delays if three conditions are fulfilled: AI is not a decisive factor but an auxiliary one, legislation on data protection and AI-governance preceded mass-usage and independent oversight starts with the first pilot. A specific legislation, institutional oversight and amendments in the existing laws of evidence, criminal procedure and policing law are, therefore, needed in Pakistan.

These would reconcile the need to make urgent reform with respect, fairness and legitimacy. Future studies are needed to incorporate fieldwork with stakeholders, pilot evaluations, Urdu/regional language legal datasets, and appeal challenges with AI-generated evidence.

Conflict of Interest

The authors showed no conflict of interest.

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References

- Ali, S., & Hassan, M. (2022). Evaluation of pending cases in the judiciary of Pakistan: Figures and statistics. *Pakistan Social Sciences Review*, 6(2), 592–602. [https://doi.org/10.35484/pssr.2022\(6-II\)50](https://doi.org/10.35484/pssr.2022(6-II)50)
- Angwin, J., Larson, J., Mattu, S., & Kirchner, L. (2016, May 23). Machine bias. *ProPublica*.
- Attorney General's Office (UK). (2018, November). Review of the efficiency and effectiveness of disclosure in the criminal justice system. *HM Government*.
- Blue, R., Hoffman, R., & Berg, L.-A. (2008). Pakistan rule of law assessment — Final report. *United States Agency for International Development*.
- Cappelletti, M., & Garth, B. (1978). Access to justice: The worldwide movement to make rights effective. *Buffalo Law Review*, 27(2), 181–292.
- Chouldechova, A. (2017). Fair prediction with disparate impact: A study of bias in recidivism prediction instruments. *Big Data*, 5(2), 153–163.
- Constitution of the Islamic Republic of Pakistan 1973 (as amended), Articles 4, 9, 10A, 14, 25, 37(d), 175.
- Code of Criminal Procedure 1898 (Act V of 1898) (Pakistan).
- Council of Europe, European Commission for the Efficiency of Justice (CEPEJ). (2018). European ethical charter on the use of artificial intelligence in judicial systems and their environment. *Council of Europe*.
- Directive (EU) 2016/680 of the European Parliament and of the Council (Law Enforcement Directive), OJ L 119/89.
- Digital Personal Data Protection Act 2023 (India).
- Electronic Transactions Ordinance 2002 (Pakistan).
- Government of Pakistan. (2018). Digital Pakistan policy. *Ministry of Information Technology and Telecommunication*.
- Habermas, J. (1996). Between facts and norms: Contributions to a discourse theory of law and democracy (W. Rehg, Trans.). *MIT Press*.
- Hildebrandt, M. (2015). Smart technologies and the end(s) of law: Novel entanglements of law and technology. *Edward Elgar*.
- Hussain, Z., Chen, M., Yunjiao, X., Abbas, S., & Tabassam, A. (2026). Carbon neutrality through legislation, judicial oversight, and environmental policies in developing countries. *Environment, Development and Sustainability*, 1-34.
- International Crisis Group. (2010). Reforming Pakistan's criminal justice system (Asia Report No. 196). International Crisis Group.
- Ishfaq Ahmed v. Mushtaq Ahmed, PLD 2025 SC 582 (Supreme Court of Pakistan).
- Justice K.S. Puttaswamy (Retd.) v. Union of India, (2017) 10 SCC 1 (Supreme Court of India).
- Law and Justice Commission of Pakistan. (2024). Bi-annual report of judicial statistics of Pakistan (July–December 2023). *LJCP Secretariat*.
- Law Commission of India. (1987). One hundred twentieth report on manpower planning in judiciary: A blueprint. *Government of India*.

- Liaquat Hussain v. Federation of Pakistan, PLD 1999 SC 504 (Supreme Court of Pakistan).
- Ministry of Home Affairs, Government of India. (2022). Inter-operable Criminal Justice System (ICJS). <https://www.mha.gov.in/en/commoncontent/inter-operable-criminal-justice-system-icjs>
- National Database and Registration Authority Ordinance 2000 (Pakistan).
- National Judicial (Policy Making) Committee. (2026). National guidelines for the use of artificial intelligence in judicial institutions. *Supreme Court of Pakistan / Law and Justice Commission of Pakistan*.
- Niiler, E. (2019, March 25). Can AI be a fair judge in court? Estonia thinks so. *Wired*.
- OECD. (2019). Recommendation of the Council on artificial intelligence. OECD/LEGAL/0449.
- Pasquale, F. (2015). The black box society: The secret algorithms that control money and information. *Harvard University Press*.
- Police Order 2002 (Chief Executive's Order No. 22 of 2002) (Pakistan).
- Posner, R. A. (2014). Economic analysis of law (9th ed.). *Wolters Kluwer*.
- Qanun-e-Shahadat Order 1984 (President's Order No. 10 of 1984) (Pakistan).
- Re, R. M., & Solow-Niederman, A. (2019). Developing artificially intelligent justice. *Stanford Technology Law Review*, 22(2), 242–289.
- Regulation (EU) 2024/1689 of the European Parliament and of the Council (Artificial Intelligence Act), OJ L, 2024/1689.
- Richardson, R., Schultz, J. M., & Crawford, K. (2019). Dirty data, bad predictions: How civil rights violations impact police data, predictive policing systems, and justice. *New York University Law Review Online*, 94, 15–55.
- Shahnaz Begum v. The Honourable Judges of the High Court of Sind and Baluchistan, PLD 1971 SC 677 (Supreme Court of Pakistan).
- Sindh Witness Protection Act 2013 (Pakistan).
- Sourdin, T. (2018). Judge v Robot? Artificial intelligence and judicial decision-making. *UNSW Law Journal*, 41(4), 1114–1133.
- Stern, R. E., Liebman, B. L., Roberts, M. E., & Wang, A. Z. (2021). Automating fairness? Artificial intelligence in the Chinese courts. *Columbia Journal of Transnational Law*, 59(3), 515–553.
- Susskind, R. (2019). Online courts and the future of justice. Oxford University Press.
- United Nations. (2015). Transforming our world: The 2030 agenda for sustainable development, Goal 16. UN General Assembly Resolution A/RES/70/1.
- Watan Party V. Federation of Pakistan, PLD 2006 SC 697 (Supreme Court of Pakistan).
- Zalnieriute, M., Bennett Moses, L., & Williams, G. (2019). The rule of law and automation of government decision-making. *Modern Law Review*, 82(3), 425–455.
- Završnik, A. (2020). Criminal justice, artificial intelligence and human rights. *ERA Forum*, 20(4), 567–583.
- Zweigert, K., & Kötz, H. (1998). An introduction to comparative law (3rd ed., T. Weir, Trans.). *Oxford University Press*.