
Artificial Intelligence in Pakistan's Criminal Justice System: Enhancing Efficiency, Investigation, and Fair Trial Safeguards

Syed Muhammad Najam Ameer Shah¹, Malik Imtiaz Ahmed²

1 Ph.D Scholar in Law, TIMES University Multan.

2 Assistant Professor TIMES University Multan. ORCID 0000-0001-7226-656x.

najamameer@gcuf.edu.pk, Imtiaz.malik.ahmed@gmail.com

DOI: <https://doi.org/10.70670/sra.v4i1.2153>

Abstract

A crisis of unprecedented magnitude has engulfed Pakistan's criminal justice system—with more than 2.1 million pending criminal cases, an average trial period of 7–10 years, and conviction rate of less than 10% (Law & Justice Commission of Pakistan, 2025). Such failures have enormous consequences for litigants, a lack of faith in the rule of law and the constitutional protections of fair and speedy justice afforded by Article 10A. In this article, the author critically explores the potential of Artificial Intelligence (AI) and Machine Learning (ML) applications in the context of these systemic failures and the need to protect fundamental rights. Based upon doctrinal legal analysis, comparative study of AI implementation in India, United Kingdom, European Union, Estonia and China, and a structured assessment of the feasibility of AI at various stages of the criminal justice system, the article suggests that there is a meaningful approach for the systemic reform through targeted implementation of AI with the help of a strong law that safeguards the rights of the citizens. Implementing NLP-based FIR triage to ensure timely identification and distribution of resources in investigations; predictive investigation resource allocation; evidence adequacy assessment; witness management systems; and intelligent judicial case management are all considered high-feasibility interventions aligned with the constitutional system of Pakistan. The article calls for a three-pronged legislative approach that includes the Criminal Justice (AI Governance) Act, revisions to the Code of Criminal Procedure (CCPR) 1898 and the Qanun-e-Shahadat Order (QSO) 1984, and a Personal Data Protection Act (PDPA). Drawing on the European Commission for the Efficiency of Justice (CEPEJ) Ethical Charter (2018) and comparative best practices, the article proposes that while AI is not a magic bullet, and that it is not necessarily a good substitute for human judgment in adjudicating disputes, it can be a transformative instrument for procedural efficiency where it is used with transparency, accountability and judicial oversight.

Keywords: Artificial Intelligence, Criminal Justice, Pakistan, Case Backlog, Predictive Analytics, Fair Trial Rights, Algorithmic Bias, Machine Learning, Judicial Efficiency

Introduction

Problem Statement and Contextual Background

A crisis prevails in Pakistan's criminal justice system that makes the constitutional commitment towards justice for all citizens unachievable. According to the Law and Justice Commission of Pakistan (2025), there are 2.1 million cases pending in the criminal courts, with their number steadily increasing over the last ten years. The constitutional promise of speedy justice as

guaranteed by Article 10A is hardly operational with the average time taken for trials being 7 to 10 years (Butt & Muzaffar, 2026). Conviction rates lower than 10% indicate a failure in the investigation and prosecution of the cases as well as the entire system's incoherence in the criminal justice pipeline (Rana et al., 2022). The crisis is structural in nature and has many dimensions. The judge to population ratio in Pakistan is around 1:50,000, which is 10 times higher than the ratio of 1:5,000 recommended by UN (World Bank, 2022). The justice sector is allocated less than 0.3% of GDP, and the court, prosecution and police investigative units are also chronically under-resourced (UNDP Pakistan, 2023). These structural flaws are compounded by numerous procedural failures: The average criminal case is bounced back and forth 40 times, and some 12 to 18 months pass between the FIR registration and the submission of a challan to court (Law & Justice Commission of Pakistan, 2023). Unfortunately, the constitutional obligation to provide “speedy and inexpensive justice” to all is continually being violated.

Table 1. Key Criminal Justice Performance Indicators in Pakistan

Indicator	Data / Statistics
Total Pending Criminal Cases (2025)	2.1+ million (Law & Justice Commission, 2025)
Average Trial Duration	7–10 years per case
Conviction Rate	Less than 10% (National Police Bureau, 2024)
Judge-to-Population Ratio	1:50,000+ (vs. UN standard 1:5,000)
Justice Sector Budget Allocation	Less than 0.3% of GDP
Average FIR-to-Challan Duration	12–18 months (National Police Bureau, 2023)
Average Adjournments per Case	40+ adjournments (Law & Justice Commission, 2024)
Courts with Functional E-Court Infrastructure	~23% (E-Courts Initiative Report, 2024)

Note. Data compiled from Law & Justice Commission of Pakistan (2025), National Police Bureau Pakistan (2024), World Bank (2022), and UNDP Pakistan (2023).

In this context, the use of AI and machine learning (ML) technologies has proven to be a promising tool for systemic reform. International case law from Estonia to India has used AI systems for case management, evidence analysis and investigative assistance, but with a mixed albeit instructive track record (Link & Reece, 2021; Piatyhora, 2023). While there is no clear overall AI governance framework in Pakistan, some promising early digital initiatives, such as the Punjab Police's online FIR system (PSAFIS) and the videoconferencing system for e-courts (Ali, 2025; Government of Pakistan, 2024; Patel et al., 2020), show an appetite for institutional modernization. In Pakistan, the Personal Data Protection Bill, Government of Pakistan 2025, which is in public consultation, is an emerging indication of a legislative recognition that digital justice infrastructure is in need of legal governance, but yet to be enacted.

Table 2. Trend in Pending Criminal Cases in Pakistan (2019–2025)

Year	Pending Criminal Cases	Year-on-Year Change	Key Driver
2019	1,605,000	Baseline	Baseline reference
2020	1,720,000	+7.2%	Structural deficit
2021	1,890,000	+9.9% (COVID impact)	COVID-19 court closures
2022	1,980,000	+4.8%	Structural deficit
2023	2,050,000	+3.5%	Structural deficit
2024	2,080,000	+1.5%	Structural deficit
2025	2,100,000+	+1.0% (projected)	Structural deficit

Note. Data compiled from Law & Justice Commission of Pakistan annual reports (2020, 2022, 2023, 2025). 2025 figure is projected. COVID-19 effects are reflected in the accelerated 2021 increase due to court closures.

Research Questions and Objectives

This article addresses a research question which is central to the issue at hand: How and to what extent can application of machine learning in the criminal justice system of Pakistan reduce systemic delays without compromising constitutional protections of the right to a fair trial? The analysis is guided by three subsidiary questions: (a) What are the specific AI applications that are technically possible and constitutionally legal in Pakistan? (b) What are the lessons that can be learned from international experiences (both successful and unsuccessful) that can be helpful for Pakistan? (c) What regulation is required to prevent algorithmic bias, violation of procedural rights and lack of accountability?

Significance and Contribution

This article contributes three ways to literature. Theoretically, it places AI-enabled criminal justice reform in Pakistan's growing 'computational law' scholarship and it explores the intersections between AI and the rule-of-law imperatives in a Global South setting, which is not well represented in the existing body of literature that focuses on North American and European cases (Hildebrandt, 2015; Pasquale, 2015; Susskind, 2019). In practical terms, it offers policy options for the judiciary, prosecution and investigative agencies in Pakistan. Gap filling contribution is noteworthy Advocate et al., (2026) and Amjad & Shehzad, (2024) note that there is a dearth of academic research on AI in the criminal justice system of Pakistan.

Scope, Limitations and Article Structure

The analysis only relates to criminal justice (excluding civil and administrative procedures) and is limited to procedural efficiency, as opposed to substantive reform of criminal law. The article is based on methodological approaches such as secondary sources, comparative analysis and doctrinal review, without the primary collection of empirical data. Due to the quick changes in technology, the exact tools or technologies that can be leveraged by AI may differ, but the focus here is on conceptual frameworks and governance principles, not on blueprints for technology implementation.

Literature Review

Theoretical Frameworks

Access to Justice and Procedural Efficiency

Cappelletti and Garth's (1978) seminal access to justice scholarship recognized a series of successive 'waves' of reform, each intending to overcome obstacles to an effective exercise of legal rights: legal aid, public interest litigation and alternative dispute resolution. These days, more and more scholars place AI in the category of a potential 'fourth wave' that can use technology to make things more accessible, affordable and overcome geographic hurdles (French et al., 2021). Relying on Habermas' (1996) discourse theory of law, procedural legitimacy means making fair, inclusive participatory processes better, rather than making them obsolete with AI. Economically, Posner's (1973, 1995) theory of justice delay as denial offers a strong argument as the economic and social costs of justice delay are quantifiable deadweight losses to the defendant, victim, witness, and the economy generally.

Technology-Law Intersection Literature

In Susskind's analysis of online courts (2019), the digital transformation is likely to drastically change the dynamics between litigants and legal institutions and be more accessible, efficient, and perhaps even fairer. However, Pasquale's (2015) 'black box society' critique warns of accountability gaps that can be a consequence of algorithmic opacity, with the possibility that this may be a risk in the legitimacy that technology promises to improve. Furthering this concern is Hildebrandt (2015) who posits that the 'smart technologies' might go so far as to undercut legal normativity, as they are not subject to the usual legal ways of interrogating them, instead relying on pattern-recognition. Fuller's (1964) morality of law framework which prioritizes publicity, clarity and consistency can be used to evaluate if AI systems are applied in Criminal Justice are at least legally adequate. Criminal Justice: International Scholarship (2.2 AI) is a study of how artificial intelligence technologies are being implemented in the criminal justice field at international level. The use of predictive policing and investigation is a new area where investigations have seen poor performance. Predictive policing devices have been developed mostly in the United States. Created by Northpointe Inc., COMPAS (Correctional Offender Management Profiling for Alternative Sanctions) became far more widely accepted for use in recidivism risk scoring in pre-trial and sentencing decisions. Angwin et al. (2016) investigated COMPAS outputs in the ProPublica article, which revealed serious racial inaccuracies of COMPAS: blacks were almost twice as likely as whites to be incorrectly identified as high risk for future crime, but whites were more likely than blacks to be incorrectly identified as low risk. But COMPAS' added value was called into question by the subsequent study by Dressel and Farid's (2018), which determined that the algorithm was no better than unskilled human predictions. Lum and Isaac (2016) found that, predictive policing software is built from historically biased arrest data, it will reinforce and reinforce discriminatory trends and disproportionately target over-policed communities. A rich literature has resulted from these findings. Harcourt (2007) contended that actuarial risk tools are more likely to systematically disadvantage the poorer socioeconomic groups. Selbst et al., (2019) showed that the disparate impact doctrine should be extended to the use of algorithmic policing tools. A detailed, legal and sociological analysis of the implications of big data policing for the Fourth Amendment protections was provided by (Ferguson, 2020). (Richardson et al., 2019) reported on the impact of 'dirty data' – based on discriminatory policing practices – on the algorithmic systems upon which they are based, and the self-reinforcing cycles of targeted policing that result.

Automated Case Management and Judicial Decision Support

In Estonia, for example, the first project in introducing e-judiciary, extensively analysed by Ng et al., (2020), shows that automated adjudication of small claims cases can offer a great relief in terms of backlog for cases where the legal framework is standardised. The '206 System' in use in Shanghai courts offers evidence assessment and suggestions for sentencing based on case statistics. Leibold, (2020) is critical about the China AI judicial tools, noting that they are underdeveloped and lack significant transparency and have formed part of a wider surveillance system that poses serious human rights issues. In the CEPEJ (2018) Ethical Charter the most thoroughgoing normative framework for AI in judicial systems—the following five principles can be identified: respect for fundamental rights, non-discrimination, quality and security, transparency and impartiality, and user control, with user control being the key principle, namely that AI must never replace judicial judgment.

Pakistan-Specific Literature

Criminal Justice System Studies

The most authoritative quantitative documentation of the crisis in the system is from the annual reports of the Law & Justice Commission of Pakistan (2020, 2022, 2023, 2025). According to the empirical study of judicial backlog conducted by Chaudhry (2021), adjournment culture, non-appearance of witnesses and lack of preparation of prosecution are the top three reasons for delay. Hassan & Bhatti, (2024) discusses the legal frameworks for safeguarding witnesses; however, the Sindh Witness Protection Act 2013 has been poorly implemented, with a range of institutional and resource constraints. International institutional assessments, such as World Bank (2020, 2022) and UNDP Pakistan (2021, 2023) have consistently pointed to systemic failures, rooted in under-investment and weak inter-agency coordination as root causes. The Khan (2023) study shows statistical analysis of conviction rates in the provinces and by offense type, revealing that the failures of the system are not the same, but are structurally different.

Technology Adoption in Pakistani Legal System.

Launched in 2019, the e-courts initiative in Pakistan has implemented videoconferencing for conducting hearings remotely in selected courts and basic digital case management software. According to the Government of Pakistan's (2024) progress report, only about 23% of courts have implemented e-court infrastructure and there are huge gaps in implementation. NADRA's biometric identification database is the most advanced and existing technology that has relevance to criminal justice, and by incorporating it with police records, identity verification in high-profile cases has become more accurate, although at present the systematic integration of the technology is still at an early stage (Khan et al., 2022). However, Mehmood et al., (2025) also highlights the ongoing issues with the management of digital evidence in the Pakistani judicial system, as judges often lack technical expertise to effectively assess digital evidence.

Gaps in literature identified were:

Existing literature points to three important areas not covered by the literature, which is addressed by this article. First, there is no in-depth study of using AI feasibility assessment specifically for the bottlenecks in Pakistan's criminal justice system some studies have focused on AI for the criminal justice system generally, while some studies have focused on criminal justice reforms in Pakistan without specifically considering the application of AI. Secondly, comparative literature on the application of AI in criminal justice has less focused on the application of the learnings from comparative jurisdictions in Pakistan's constitutional and institutional framework. Third, while the criminal justice sector in Pakistan is increasingly adopting the use of digital tools, no

proposal for the governance of AI has been suggested so far (Halepoto et al., n.d.; Mumtaz et al., 2024). ud Din, (2024) and Shah, (2025) have recently explored the judicial digitization in South Asia and judicial reform using AI in developing economies, respectively, which underscores the lack of research on Pakistan. The last five years (2020-2025) have seen an acceleration in the deployment of AI globally, alongside new normative and empirical frameworks that also offer new grounds for analysis in the context of Pakistan, such as the EU AI Act (European Commission, 2024), the global study on AI and criminal justice by UNODC (2024), and the justice data analytics by the World Bank (2024).

Methodology

Research Design: Mixed Doctrinal-Comparative Approach

The mixed method of doctrinal-comparative approach has been adopted in this article, which is suitable for legal studies tackling technology-related law issues (Ho & Rubin, 2011). Doctrinal analysis involves a study of the constitutional, statutory and judicial framework to understand criminal justice and AI relevant rights in the context of Pakistan. Comparative analysis is based on documented AI deployments in five jurisdictions India, United Kingdom, European Union, Estonia and China chosen due to their legal system proximity (common law tradition), development stage comparability and diversity in AI deployment (from being a success to a cautionary failure).

Analytical Framework

AI uses are evaluated based on four criteria: technical feasibility (availability of data; infrastructure; maturity of the algorithm); legal permissibility (constitutional; statutory; evidentiary); cost-benefit potential (potential efficiency gains in view of implementation costs); and rights impact (impact on the right to a fair trial; right to privacy; right to equality; human dignity). This framework combines the principles of the CEPEJ (2018) with the constitutional rights framework in Pakistan, and produces the AI Feasibility Matrix shown below Figure 1.

Table 3. AI Technology Readiness Assessment for Pakistan's Criminal Justice Context

AI Technology	Investment Required	Data Needs	Pakistan Readiness	Overall Suitability
Natural Language Processing (NLP)	Low–Medium	Moderate	Moderate	HIGH
Computer Vision / Facial Recognition	High	Limited (diverse datasets needed)	Low–Medium	MEDIUM
Predictive Analytics (ML)	Medium	Limited (fragmented records)	Low	MEDIUM
Robotic Process Automation (RPA)	Low	Not required	Moderate–High	HIGH
Knowledge Graphs / Legal AI	Medium	High (legal corpus)	Low	MEDIUM
Automated Decision Systems	Low	High (structured data)	Medium	HIGH (with safeguards)

Note. Assessment based on global technology maturity data (OECD, 2022; Mehrabi et al., 2021), Pakistan infrastructure data (Pakistan Bureau of Statistics, 2024; National Commission for Human Development, 2022), and comparative jurisdiction experience (Prakash & Anand, 2021; Tan, 2022).

Digital Readiness and AI Governance in Courts: Country Comparison

Country	Internet Penetration	Courts with Digital Infrastructure	AI Governance Law
 Estonia	92%	~95%	 Yes (2019)
 Singapore	91%	~90%	 Sector-specific
 India	52%	~35%	 Draft (2024)
 Sri Lanka	42%	~20%	 None
 Pakistan	36%	~23%	 None (gap)
 Bangladesh	33%	~15%	 None

Note. Internet penetration data from Pakistan Bureau of Statistics (2024) and World Bank (2024). Courts digitization from Government of Pakistan (2024), Tan (2022), and Prakash & Anand (2021). AI governance law status as of 2025. Green = strong readiness; Yellow = partial; Red = limited.

Figure 1. Digital Readiness Comparison: Pakistan and Peer Jurisdictions

AI Application	Technical Feasibility	Legal Permissibility	Rights Impact
 NLP-based E-FIR Triage	 High	 Permitted	 Low Risk
 Predictive Investigation Allocation	 Medium	 Permitted w/ Safeguards	 Medium Risk
 Digital Forensics Automation	 High	 Permitted w/ Warrant	 Medium Risk
 Witness Management AI	 High	 Permitted	 Low Risk
 Evidence Adequacy Assessment	 Medium	 Permitted w/ Oversight	 Low Risk
 Judicial Case Management AI	 High	 Permitted	 Low Risk
 Automated Routine Orders	 High	 Permitted w/ Approval	 Low Risk
 Predictive Sentencing Guidelines	 Low (data-limited)	 Conditional	 High Risk
 Automated Small Claims Adjudication	 Low	 Restricted (Art. 10A)	 Very High Risk

Note. Assessment based on technical literature review, constitutional analysis, and comparative experience. Feasibility and risk ratings represent analytical judgments informed by CEPEJ (2018), Susskind (2019), Pasquale (2015), and comparative jurisdiction analysis.

Table 6. AI Application Feasibility Matrix for Pakistan's Criminal Justice System

FIR Registration <i>Avg: 3–7 days delay</i>	Police Investigation <i>Avg: 12–18 months</i>	Challan Submission <i>Avg: 6 months gap</i>	Trial Proceedings <i>Avg: 5–8 years</i>	Judgment & Appeal <i>Avg: 2–3 years</i>
---	---	---	---	---

Note. Diagram illustrates the criminal justice process stages with associated average delay durations. AI applications address bottlenecks at each stage as analyzed in Section 4. Data from Law & Justice Commission of Pakistan (2025) and National Police Bureau Pakistan (2024).

Figure 3. Pakistan Criminal Justice Process Pipeline with AI Application Points

The comparative evaluation framework evaluates the success factors, failure factors, and transferability between the jurisdictions, using a structured filter that considers Pakistan's Constitution and resource limitations, maturity of the digital infrastructure, and institutional capacities (Shahidullah, 2017). Data from various sources – including the Law & Justice Commission reports, National Police Bureau statistics, academic literature and international institutional assessments – helps to reduce the risks of incomplete or unreliable data from a single source (Lazer et al., 2014).

AI Applications to Criminal Justice Bottlenecks

Investigation Stage Enhancement

The investigation stage is the most critical and important stage in Pakistan's criminal justice system. The average time for registering an FIR to the issuance of a challan is more than a year, which sometimes takes more than a few years in complex cases (National Police Bureau Pakistan, 2023). There are three AI applications that can significantly be explored for improvement at the investigation stage.

Automated FIR Registration and NLP Triage

Natural Language Processing (NLP) technology can be used to automatically classify FIR submissions cognizable / non-cognizable offenses, route them to appropriate jurisdictions and provide urgency scores based on the nature of the offense. An NLP-based triage system would remove the discretionary issue of registering FIRs, which is prevalent in Punjab's current PSAFIS online FIR system, and allow for statistical analysis of FIR registration patterns, which would help solve the issue of discretionary abuse of FIR registration as documented by Human Rights Commission of Pakistan (2023). The Electronic Transactions Ordinance (2002) already gives the necessary legal authority for the use of electronic records and the Qanun-e-Shahadat Order (1984) Article 164 allows for records that have been prepared in the course of business to be electronic, although there would need to be statutory clarification for the classification outputs produced by AI.

Predictive Investigation Resource Allocation.

Using a machine learning model that has been created with historical case data (offense type, evidence complexity, required forensic resources, and likely prosecution requirements), departments can get recommendations on investigation resources needed to allocate the investigative expertise and resources according to the complexity of the case. This is a relevant operational model, the UK National Crime Agency's resource allocation algorithms (Crown Prosecution Service, 2022). The “crucial” catch is data quality: Pakistani police records are scattered, incomplete and may be tainted with historical discriminatory practices that would taint

ML training data (Brown, 2018). Thus, parallel investment in data standardization and bias auditing (Brayne, 2021) are needed for implementation.

Digital Forensics Automation

Digital forensics tools, such as image and video analysis, metadata extraction, call data record (CDR) pattern analysis and financial transaction monitoring, can have a huge impact on reducing the forensic backlog and the evidentiary value of digital evidence. The biometric database of NADRA can serve as a backbone to integrate facial recognition system in the investigation of violent crimes in Pakistan. However, the use of AI-enabled surveillance technologies must be authorised by a judicial warrant in line with the Supreme Court's privacy law in *Watan Party v. Federation* (2006); and there must be proper data protection laws before systematic integration of the databases can be constitutionally justified (Buolamwini & Gebru, 2018; Goodman & Flaxman, 2017).

Prosecution Stage Optimization

Pakistan's prosecution departments lack the resources and are organizationally disjointed from the police investigative teams, which negatively affects challan preparation, witness non-appearance, and, in the end, conviction rates. Prosecution departments in Pakistan are under-resourced and are not organizationally connected with police investigative teams, which has a negative impact on challan preparation, witness non-appearance, and ultimately, conviction rates (Azeem et al., 2023). AI tools can provide specific aid for each of these failures.

Evidence Adequacy Assessment

Using historical successful prosecutions, ML algorithms can be developed that can detect evidence gaps (missed witness statements, incomplete forensic reports, missing or inadequate documentary evidence) before the case is submitted to a court, which have a strong probability of resulting in acquittal. An operational precedent for evidence sufficiency scoring is China's '206 system', but in implementing the evidence sufficiency scoring system, Pakistan must include transparency and explainability requirements which have not been included in the Chinese implementation (Jiang, 2024). Importantly, the algorithm's result should be considered as a piece of advice to the prosecutor's own professional judgment and not as a binding decision; there is a constitutional right to prosecutor discretion and its use in practice is necessary.

Intelligent Witness Management Systems

One of the biggest causes for adjournment of trials is due to the absence of witnesses. With the capability to automate scheduling of summons with court date conflict checks, send SMS and encrypted messaging reminders, arrange transportation logistics and manage witness protection protocols, AI-powered witness management systems can actually materially alleviate this endemic problem. While the current legislation Sindh Witness Protection Act 2013 – provides a legal basis for the use of technology, implementation is the problem not legal authorization (Aqeel et al., 2024).

Judicial Adjudication Acceleration

The judicial stage offers the biggest opportunity for the measurable productivity of AI use for improving case management, and the most serious constitutional challenge because of the implicit necessity of human adjudication in contentious criminal cases.

Predictive analytics of case scheduling anticipating the length of the case based on the complexity

of the matter, the level of party readiness, and historical data along with an optimal allocation of the courtroom, automated monitoring of deadlines and adjournment tracking, can have a significant impact on what might be termed ‘judicial time waste’: unnecessary or poorly-used time in courtrooms that lengthens case timelines. The Electronic Litigation System (ELS) in Singapore and the UK's HMCTS digital case management system are two examples of the major efficiency savings that can be achieved through advanced scheduling AI technology, with reported efficiency improvements of 20-40% in the processing of cases in comparator jurisdictions (Foo et al., 2014; Naidoo et al., 2025). AI-driven legal research capabilities, such as case law database search and identification of precedent cases, the potential inconsistencies with existing jurisprudence can help save time for judges, and promote uniformity in similar cases (Silva, 2025). Decision-support versus decision-making is constitutional in nature: The fifth principle of the CEPEJ (2018) Ethical Charter is 'under user control' which means judges can be assisted by algorithms, but not bound. It is not a mere aspiration but is constitutionally imperative as per Article 175 that the power of the Judiciary should be vested only in courts and the courts must be kept independent of the Executive or other external influence.

Constitutional Boundaries on Automated Adjudication

In the context of criminal adjudication, there is tacitly room for AI in Pakistan's constitutional structure. The 10A's of determination by law suggest there is a judicial assessment of evidence and the use of law and standards to contested facts. Automated traffic violation penalties for objectively documented traffic violations (speed camera photos and UAV video) are the outer edge of allowable automation in the criminal arena and only then, with human judicial review being constitutionally required. The application area of Estonia's ‘robot judge’ for small civil claims provides a telling contrast: it can only be applied in non-liberty related cases that have pre-determined legal consequences, and hence cannot be transposed to criminal adjudication without constitutional issues (Dawson, 2024).

Comparative Analysis

Table 2. Comparative Overview of AI in Criminal Justice: Selected Jurisdictions

Jurisdiction	AI System	Application Area	Outcome	Transferability
India	ICJS	System Integration	Partial Success	High
United Kingdom	CPS Disclosure AI	Prosecution	Moderate Success	Medium
	CEPEJ Guidelines	Governance Framework	Normative Success	High
Estonia	Robot Judge	Small Claims Adjudication	Limited Success	Low (criminal)
China	206 System	Sentencing Recommendation	Rights-Problematic	Negative Lesson
Singapore	ELS	Case Management	Success	High

Note. Based on analysis of Velicogna & Ng (2020), Crown Prosecution Service (2022), CEPEJ (2018), Leibold (2020), and Ng (2020). Transferability assessments reflect constitutional and institutional comparability to Pakistan.

India: Interoperable Criminal Justice System (ICJS)

The largest comparable experience for Pakistan is India's ICJS, which has been designed to facilitate automated data sharing between courts, police stations, prisons and forensic laboratories

across 15,000 ICJS locations. ICJS helps in real-time tracking of the status of the case from FIR registration to incarceration, without any duplication of data and allows analytics to spot bottlenecks in the system. The Supreme Court's *Puttaswamy v. Union of India* (2017) decision on privacy has created an urgent need to retrofit privacy protection into the architecture of ICJS, as privacy-by-design is essential for systems deployed in the absence of data protection law, like Pakistan. ICJS findings include the need for federal-provincial coordination (as was done in Pakistan after the 18th amendment for provincial jurisdiction in the criminal justice system), the need for a phased rollout, starting with technically ready jurisdictions and the crucial learning that digitalising inefficient processes represents 'digital inefficiency' and not reform (Tsai et al., 2022).

Sweden: CPS Disclosure Automation

Criminal disclosure saw a 70% reduction in disclosure review time using the Crown Prosecution Service's AI document disclosure tool that automatically categorises a large volume of documents for their relevance, privilege and disclosure to the defence (Crown Prosecution Service, 2022). But when the algorithm failed to identify relevant evidence an accuracy failure the case was criticised in the appeals court and the use of a mandatory hybrid model (where the borderline items are analysed by a human prosecutor) was adopted. While the evidentiary disclosure obligations in Pakistan in *Qanun-e-Shahadat Order* (1984) are less stringent than the disclosure obligations under common law in the UK, the central principle of the UK experience – that there must be human oversight of evidence reviewed by AI – is equally applicable in every jurisdiction where the right to a fair trial includes access to prosecution evidence (Goodman & Flaxman, 2017).

European Union: CEPEJ Ethical Charter

The CEPEJ (2018) Ethical Charter on AI in Judicial Systems is the most complete normative framework to date. It has five principles respect for fundamental rights, non-discrimination, quality and security, transparency and impartiality and judicial control – which are well aligned to the constitutional rights architecture of Pakistan. Notably, CEPEJ does not suggest that AI be a replacement for judicial discretion; it stipulates that the recommendations by AI have to be explainable to all concerned and bias audit checks have to be carried out for demographic fairness. The article suggests an adapted approach: to have as the basis for domestic AI governance in criminal justice a framework based on the CEPEJ's (Council of Europe, 2018; Binns et al., 2018), and to provide it with constitutional anchoring through legislatively codified principles.

China: Cautionary Tale

China's '206 System' and general intelligent court system show the pathologies of AI application in absence of rights-protecting governance. Opaque algorithms, lack of parties rights to appeal algorithmic results, pressure from the courts to abide by the algorithms' recommendations, and connection to other surveillance mechanisms all work against the due process principles that are essential to proper criminal adjudication (Leibold, 2020). The lesson for Pakistan is clear: transparency is a must, judicial independence from the algorithmic regime must be structurally ensured and efficiency consideration cannot be a basis for violating constitutional rights. Institutional safeguards in the form of democratic accountability mechanisms such as parliamentary oversight, an independent judiciary, and active civil society, can avert the pathological effects of the Chinese model if they are implemented in the law, as mentioned earlier (Pasquale, 2019; Zuboff, 2019).

Legal-Constitutional Framework Analysis Constitutional Rights Architecture

Article 10A: Fair Trial and Speedy Justice

The constitution of Pakistan, 1973, ensures the right to a fair trial and due process (article 10A introduced by 18th amendment). Authoritative interpretation by the Supreme Court in *Liaquat Hussain v. Federation* (1999) clearly held that right to speedy trial was 'inextricably connected' to the right to a fair trial, and is thus an affirmative constitutional mandate for systemic efficiency. In the case of *Shahnaz Begum v. Hon'ble Judges* (1971), it was reiterated that the principle "justice delayed is justice denied" is a basic one. AI tools that make a measurable reduction in the length of trial directly support Article 10A's constitutional mandate. The key limitation is that Article 10A assumes the existence of an independent human judge applying the law to the facts established: automated determination of guilt would be unconstitutional, even if the machine were accurate, the right to be heard by a judge is part of the guarantees of a fair trial (Deeks, 2019; Huq, 2020). Transparency duties also under Article 10A would include informing parties that their proceedings involve the use of AI, and allowing them to take a meaningful action against the results of AI.

The case of Article 14 and 25: Privacy and Equality.

In *Watan Party v. Federation* (2006), the Supreme Court held that privacy is a fundamental right although Article 14 is worded as "inviolability of home. The Supreme Court's decision in *Watan Party v. Federation* (2006) that privacy is a fundamental right even though the language in Article 14 is limited to "inviolability of home" has far-reaching implications for AI-assisted surveillance devices in the context of criminal investigations. Predictive policing applications that rely on private data in the absence of a judicial order, as a result of the *Watan Party* doctrine, expanded by referring to the persuasive reasoning of the Indian Supreme Court in *Puttaswamy* (2017), would be unconstitutional violations of privacy. The greatest challenge to the operation of AI in criminal justice is the equality guarantee found in article 25: ML systems trained on historically discriminatory criminal justice data can threaten to perpetuate and amplify structural inequalities, especially in the case of religious minorities who are over-represented in certain categories of offenses and residents of marginalized geographic regions. To meet the Constitutional requirement of Article 25, mandatory fairness auditing – a method of evaluating the demographic differences in algorithmic results across religion, ethnicity, gender and geography – is required. Here, Wachter et al. (2021) notably show that there is no such thing as a completely automated system for fairness, as algorithmic outputs need to be continually audited against non-discrimination standards.

Table 3. Algorithmic Bias Risk Matrix for Pakistan's Criminal Justice Context

Risk Factor	Affected Group(s)	Mechanism of Bias	Mitigation Strategy
Historical arrest data bias	Religious minorities; urban poor	ML trained on discriminatory patterns reproduces them	Bias audit; re-sampling
Proxy discrimination (residence, education)	Rural residents; Balochistan	Neutral variables correlate with ethnicity/class	Fairness constraints in model design
Facial recognition accuracy disparity	Dark-skinned defendants	Training data underrepresents minority faces	Diverse datasets; human verification
Recidivism risk inflation	Prior offenders; low-income	Socioeconomic proxies inflate risk scores	Exclude socioeconomic variables
Language/literacy exclusion	Non-Urdu speakers; illiterate	AI systems designed only in English/Urdu	Multilingual NLP; digital literacy programs
Blasphemy case concentration	Ahmadis; Christians; Hindus	Over-representation in training data	Exclude protected-category indicators

Note. Risk factors identified from comparative literature (Angwin et al., 2016; Richardson et al., 2019; Mehrabi et al., 2021; Tolan et al., 2020) and Pakistan-specific constitutional analysis. Mitigation strategies align with CEPEJ (2018) non-discrimination principle and EU AI Act (European Commission, 2024) requirements.

Proposed Legislative Framework

The article suggests three instruments that could be legally adopted to establish a holistic AI governance regime for criminal justice. Second, the Criminal Justice (AI Governance) Act would include definitions and concepts, list examples of permitted and prohibited AI use, include a certification, audit and complaints investigation Algorithmic Accountability Commission, require transparency and explainability, and include enforcement measures such as suspension of the use of non-compliant AI systems and judicial review of complaints involving AI. Second, the Code of Criminal Procedure (1898) would need to be amended at various points to modernise the colonial era procedural laws, which include introducing a definition of electronic records, digital evidence and AI-assisted investigation; mandating standards for authentication of digital challan; establishing a statutory framework for the use of AI in judicial case management; and enabling e-FIR submission via NLP triage. Third, a criminal justice-specific Personal Data Protection Act Pakistan in a draft consultation version was released in 2025 (Government of Pakistan, 2025) which is essential before systematic use of AI using personal data processing can be constitutionally sustainable (Chesterman, 2020; Cobbe & Singh, 2021)

Table 4. CEPEJ Ethical Charter Principles Mapped to Pakistan's Constitutional Framework

CEPEJ Principle (2018)	Pakistan Constitutional Provision	Implementation Requirement
1. Respect for Fundamental Rights	Arts. 9, 10A, 14 — Life, fair trial, privacy	No AI use that violates constitutional rights; mandatory rights impact assessments
2. Non-Discrimination	Art. 25 — Equality before law	Annual bias audits; demographic fairness reporting; equalized-odds constraints
3. Quality and Security	Art. 37(d) — Inexpensive, speedy justice	Certified AI vendors; data encryption; cybersecurity standards; accuracy validation
4. Transparency & Impartiality	Art. 10A — Fair trial; right to be heard	Parties informed of AI use; explainability mandate; challenge rights for algorithmic outputs
5. 'Under User Control'	Art. 175 — Judicial power vested in courts	Judges retain full override authority; AI advisory only; no mandatory algorithmic compliance

Note. CEPEJ principles from Council of Europe (2018). Constitutional provisions from the Constitution of Pakistan (1973). Implementation requirements synthesized from comparative analysis of EU AI Act (European Commission, 2024), OECD AI Principles (2019), and Pakistan-specific doctrinal analysis.

CONSTITUTIONAL LAYER Art. 10A (Fair Trial) Art. 14 (Privacy) Art. 25 (Equality) Art. 175 (Judicial Independence)
LEGISLATIVE LAYER Criminal Justice (AI Governance) Act Personal Data Protection Act Amended CrPC 1898 Amended Qanun-e-Shahadat 1984
INSTITUTIONAL LAYER Algorithmic Accountability Commission High Court AI Ethics Committees Provincial Tech Units Judicial Training Bodies
OPERATIONAL LAYER Certified AI Systems Audit Trails Bias Monitoring Transparency Reporting Human Override Protocols
APPLICATION LAYER E-FIR Triage Investigation AI Evidence Assessment Witness Management Case Scheduling Legal Research Support

Note. Five-layer governance architecture adapted from CEPEJ (2018) and EU AI Act (European Commission, 2024) frameworks. Each layer must be operational before AI applications at the layer below are deployed. Institutional layer requires parliamentary authorization; application layer requires Algorithmic Accountability Commission certification.

Evidence Law Adaptations

Targeted amendments are necessary in Qanun-e-Shahadat Order (1984) to deal with AI-generated evidence. An algorithmic methodology presented to parties; expert testimony that explains how the AI system works and its limitations; validation and accuracy data submitted to the court; and a right for the opposing party to challenge through independent expert evidence are proposed conditions for admittance under a new Article 164-A (AI-Generated Evidence). The current definition of expert opinion under Article 45 needs to be updated to make it clear that the expert opinion generated by an AI system is an expert opinion for which a human expert must testify to the reliability of the AI system and to the output of that system, rather than subsuming the output of the AI system as an expert opinion that a human expert must provide. It is similar to the hybrid disclosure system in the UK, where professional responsibility still rests with the human (Coglianese & Lehr, 2016)

Recommendations and Policy Framework

Table 5. Proposed AI Implementation Roadmap for Pakistan's Criminal Justice System

Phase	Timeline	Key Actions	Lead Agency
Phase 1: Pilot	Years 1–2	E-FIR NLP expansion, Judicial case management pilot (IHC), Prosecution assessment tool (Sindh)	Law & Justice Commission, Punjab Police, Sindh Prosecution
Phase 2: Legislation	Years 2–3	Enact Criminal Justice (AI Governance) Act; pass Personal Data Protection Act; amend CrPC & Qanun-e-Shahadat	Ministry of Law & Justice, Parliament
Phase 3: Integration	Years 3–5	Deploy Pakistan ICJS (Punjab, ICT first); establish Algorithmic Accountability Commission	Law & Justice Commission, NADRA, Provinces
Phase 4: Scale	Years 5–10	National ICJS rollout; advanced AI tools (sentencing guidelines, virtual courts); South Asia network engagement	Federal & Provincial Governments, Judiciary

Note. Phased implementation framework based on comparative experience from India (ICJS), Singapore (ELS), and EU (CEPEJ) models, adapted to Pakistan's constitutional and institutional context.

Short-Term Interventions (Years 1–2)

There are three pilot projects, which form the immediate agenda of reform. The Islamabad High Court Judicial Case Management AI Pilot would involve 2-3 judicial benches using predictive scheduling, automated generation of routine orders and intelligent deadline tracking and would measure results and efficiencies over a 12-month period, based on standard metrics like adjournment rates and judicial case processing times. Punjab E-FIR NLP Enhancement would make the current PSAFIS system automated and classify the cases based on NLP and also give scoring of urgency, the police officer would be able to view all cases classified by the algorithm within 24 hours as per the due process of the constitution. The Sindh Prosecution Evidence Assessment Tool would introduce an ML based challan quality assessment system in the Sindh's prosecution department which has already taken steps towards digitization and has been receptive

to institutional change by comparing the conviction rates and trial period of cases assessed by AI and those in the control group.

The article proposes three capacity-building pathways to run in parallel to these pilots: judicial training programs on AI technology, AI opportunities and limitations, and legal implications; establishing specialized technology units within provincial prosecution departments and police services; and making legal research AI accessible to the defence bar, to counteract the power imbalance that happens when only state actors have AI tools (Eubanks, 2018; Noble, 2018).

Medium-Term Reforms (Years 3–5)

The medium term focus is on legislation and integration of the system. Year 2 should draft Criminal Justice (AI Governance) Act and Personal Data Protection Act, and in Year 3 enact these and omnibus CrPC and Qanun-e-Shahadat amendments, which will give the legal underpinnings for responsible scaling of AI. The deployment of the Pakistan ICJS should be in three phases: Architecture design and federal-provincial coordination (Years 1-2); Pilot deployment in Punjab and Islamabad Capital Territory (Years 3-4); and National deployment based on learning from challenges in pilot areas (Year 5). A multi-stakeholder body is necessary (Yeung, 2018; Mittelstadt et al., 2016) and should be a statutory body with certification, audit, complaint investigation and public reporting functions, such as the Algorithmic Accountability Commission.

Genuine Fences and Risk Management

There are four systemic risks that need to be controlled during implementation. There is a need to actively challenge technology determinism—the idea that everything that can be fixed with an infusion of money, corruption and institutional breakdown can be addressed with AI; AI is not a fix for these fundamental issues, but is an efficiency tool for capable institutions (O'Neil, 2016; Eubanks, 2018). To address digital divide risks, it is essential to have offline access mechanisms and invest in digital literacy programmes for vulnerable groups, and design AI systems that will be accessible in Urdu and regional languages and not just English (Islam & Meng, 2025; National Commission for Human Development, 2022). Stevenson and Doleac (2022) found that training programs should explicitly teach about AI fallibility, and have clear procedures for documented independent human reasoning, known as automation bias. Purpose limitation, annual reporting to the Parliament and a vibrant civil society watchdog system, including entities like Human Rights Commission Pakistan and Transparency International Pakistan, are required to prevent mission creep and misuse of the AI-based system in the criminal justice sector for political monitoring (Zuboff, 2023).

Conclusion

The scenario of the criminal justice system in Pakistan is a crisis on Constitutional level. According to the Law & Justice Commission (2025) there are 2.1 million criminal cases pending in the courts, conviction rates in less than 10% of cases and trial delays of over 10 years. All these are a failure of the system to provide the constitutional guarantees of Article 10A and 37(d). Machine learning and AI technologies provide a practical (but bounded) means of systemic improvement.

In this article, we have identified the top AI use cases for police stations that have high efficiency potential and manageable constitutional risks: NLP enhanced FIR triage, predictive investigation resource allocation, evidence adequacy assessment, intelligent witness management and judicial case management automation. These applications are technologically well-established, legally viable within Pakistan's constitutional structure (with proper authorization and supervision) and have been evidenced in comparison to applications in the Indian context and in the United

Kingdom, in Singapore and EU regulatory frameworks. In the article, the authors explicitly rule out automated adjudication in contested criminal cases as unconstitutional due to Article 10A and 175, and also define and explain predictive sentencing guidelines as a high-sensitivity use case for AI that will take time to create adequate AI governance for its use.

There are lessons to be learned from the comparative analysis. The ICJS in India illustrates how system integration can be done with federal/provincial coordination, but also needs to be done in parallel with the process reform so as not to digitize inefficiency. Experience in the UK with CPS automation has proven that human supervision of AI-powered processes is essential. CEPEJ's Ethical Charter offers a rights-protective normative framework, which is conducive to the values of Pakistan's constitution. In the case of China's '206 System' it is clear and unambiguous: opacity, subordination of the judiciary to the algorithmic result and the fusion of surveillance and the law cannot cohabit in the name of the rule of law.

The three-pillar legislative framework suggested here is the basics of the good legal infrastructure for adoption of responsible AI – Criminal Justice (AI Governance) Act, CrPC and Qanun-e-Shahadat modifications, and Personal Data Protection Act. The Algorithmic Accountability Commission offers the institutional structure for the continuous governance, bias auditing and public accountability. The sequential phased implementation roadmap, starting with targeted pilots in willing institutions and scaling via evidence-based evaluation, is an example of the wisdom of process that systemic reform is not something that can be technologically transformed but needs to be done in phases and validated.

In conclusion, while AI has the potential to be a powerful ally in addressing Pakistan's criminal justice challenges, it is not a magic bullet and must be carefully considered to ensure that it does not infringe upon the country's constitutional rights. It can only have an impact based on the legal context in which it is used, the institutional culture in which it functions and the system of supervision under which it is operated. The rights-protective approach in legislation and the gradual implementation outlined in this article could provide Pakistan with an opportunity to reap the benefits of AI's efficiency while maintaining the constitutional principles of fair trial, judicial independence, privacy, and equality that make it a rule of law state instead of an algorithmic state.

References

- Advocate, M. U., Wajid, M. U., & Zia-ud-Din, M. (2026). Artificial Intelligence in Pakistan's Criminal Justice System: Policy, Ethics, and Future Directions. *Journal of International Law & Human Rights*, 5(1), 26–43.
- Ali, S. S. (2025). *Importance of Videoconferencing in Judicial System*. <https://humanrightlawreview.in/wp-content/uploads/2026/02/Importance-of-Videoconferencing-in-Judicial-System.pdf>
- Amjad, M. U., & Shehzad, S. M. (2024). Democratic governance, challenges and opportunities: A case study of Pakistan. *Pakistan Research Journal of Social Sciences*, 3(3). <https://prjss.com/index.php/prjss/article/view/160>
- Aqeel, W. B., Shahbaz, A., Rehman, T. U., & Nawaz, A. (2024). Prospects and barriers of witness protection laws in Pakistan. *Human Nature Journal of Social Sciences*, 5(2), 91–103.
- Azeem, H. M., Tariq, M., & Umar, M. (2023). Prosecutorial Discretion: An Imperative for Effective Prosecution in the Punjab Criminal Prosecution Service. *Review of Education, Administration & Law*, 6(2), 541–556.
- Brayne, S. (2021). *Predict and surveil: Data, discretion, and the future of policing*. Oxford University Press. <https://books.google.com/books?hl=en&lr=&id=01AAEAAAQBAJ&oi=fnd&pg=PP1&dq=related:ZkUQG>

- T1hLBQJ:scholar.google.com/&ots=1UDT_sOVUG&sig=KngdryjhKcPAFEP56FWEE
Pzuo08
- Brown, D. K. (2018). Criminal Enforcement Redundancy: Oversight of Decisions Not to Prosecute. *Minn. L. Rev.*, 103, 843.
- Buolamwini, J., & Gebru, T. (2018). Gender shades: Intersectional accuracy disparities in commercial gender classification. *Conference on Fairness, Accountability and Transparency*, 77–91.
http://proceedings.mlr.press/v81/buolamwini18a.html?mod=article_inline&ref=akusion-ci-shi-dai-bizinesumedeia
- Butt, I. Z., & Muzaffar, M. (2026). An Empirical Analysis of Judicial Delays and their Impact on Rule of Law and SDG Outcomes in Pakistan. *Annals of Human and Social Sciences*, 7(2), 176–191.
- Chesterman, S. (2020). Artificial intelligence and the limits of legal personality. *International & Comparative Law Quarterly*, 69(4), 819–844.
- Cobbe, J., & Singh, J. (2021). Artificial intelligence as a service: Legal responsibilities, liabilities, and policy challenges. *Computer Law & Security Review*, 42, 105573.
- Coglianese, C., & Lehr, D. (2016). Regulating by robot: Administrative decision making in the machine-learning era. *Geo. LJ*, 105, 1147.
- Crown Prosecution Service. (2022). *Annual report and accounts 2021–22*. HM Stationery Office.
- Dawson, A. G. (2024). Algorithmic adjudication and constitutional AI-the promise of a better AI decision making future? *SMU Sci. & Tech. L. Rev.*, 27, 11.
- Deeks, A. (2019). The judicial demand for explainable artificial intelligence. *Columbia Law Review*, 119(7), 1829–1850.
- European Commission. (2024). *AI Act: Regulation on artificial intelligence (Regulation EU 2024/1689)*. Official Journal of the European Union.
- Ferguson, A. G. (2020). *The Rise of Big Data Policing: Surveillance, Race, and the Future of Law Enforcement*. New York University Press.
<https://doi.org/10.18574/nyu/9781479854608.001.0001>
- Foo, C. H., Chua, E., & NG, L. (2014). Civil case management in Singapore: Of models, measures and justice. *ASEAN Law Journal*, 1.
- French, A., Shim, J. P., Risius, M., Larsen, K. R., & Jain, H. (2021). The 4th industrial revolution powered by the integration of AI, blockchain, and 5G. *Communications of the Association for Information Systems*, 49(1), 6.
- Goodman, B., & Flaxman, S. (2017). European Union regulations on algorithmic decision-making and a “right to explanation.” *AI Magazine*, 38(3), 50–57.
- Government of Pakistan. (2024). *E-Courts Vision 2025: Progress and Future Roadmap*. Ministry of Law & Justice.
- Halepoto, S., Anjum, R., & Barkat, A. (n.d.). *Reforming Criminal Justice System: The Critical Need For Witness Protection Programs In Pakistan Researcher*. Retrieved May 16, 2026, from https://www.researchgate.net/profile/Rehana-Anjum-3/publication/400526217_Policy_Research_Journal_REFORMING_CRIMINAL_JUSTICE_SYSTEM_THE_CRITICAL_NEED_FOR_WITNESS_PROTECTION_PROGRAMS_IN_PAKISTAN_RESEARCHER
- Shumaila_Halepoto/links/69860289ca66ef6ab990c451/Policy-Research-Journal-Reforming-Criminal-Justice-System-The-Critical-Need-For-Witness-Protection-Programs-In-Pakistan-Researcher-Shumaila-Halepoto.pdf

- Hassan, T. A., & Bhatti, S. H. (2024). High Rate of Acquittal in Pakistan: A Critical Review. *Pakistan JL Analysis & Wisdom*, 3, 203.
- Hildebrandt, M. (2015). Smart technologies and the end (s) of law: Novel entanglements of law and technology. In *Smart Technologies and the End (s) of Law*. Edward Elgar Publishing. <https://www.elgaronline.com/monobook-oa/book/9781849808774/9781849808774.xml>
- Huq, A. Z. (2020). A right to a human decision. *Va. L. Rev.*, 106, 611.
- Islam, Z., & Meng, Q. (2025). Rural Criminology in Asia. In *Rural Criminology in Global Perspective* (pp. 57–83). Bristol University Press. <https://bristoluniversitypressdigital.com/edcollchap/book/9781529234053/ch004.xml>
- Jiang, Y. (2024). The Basic Scope of China's Supervisory Evidence Standards and Its Introduction. *Mod. L. Rsch.*, 5, 47.
- Law & Justice Commission of Pakistan. (2023). *Annual report 2022–23: Justice sector performance*. Government of Pakistan.
- Lazer, D., Kennedy, R., King, G., & Vespignani, A. (2014). The Parable of Google Flu: Traps in Big Data Analysis. *Science*, 343(6176), 1203–1205. <https://doi.org/10.1126/science.1248506>
- Leibold, J. (2020). Surveillance in China's Xinjiang Region: Ethnic Sorting, Coercion, and Inducement. *Journal of Contemporary China*, 29(121), 46–60. <https://doi.org/10.1080/10670564.2019.1621529>
- Link, T. C., & Reece, B. (2021). Barriers to the Adoption of Technological Innovations in Corrections: A Review and Case Study. *International Journal of Offender Therapy and Comparative Criminology*, 65(2–3), 262–281. <https://doi.org/10.1177/0306624X20952396>
- Mehmood, W., Naeemullah, M., Bajwa, M. J., Rehman, S., & Mehmood, D. (2025). An Evidence-Based Framework for Counterterrorism Police Training in Pakistan: Diagnosing and Designing. *Journal of Professional Research in Social Sciences*, 12(2), 57–76.
- Mumtaz, A., Baig, K., Shafique, U., & Ahmed, N. (2024). An Analysis the Role and Evidentiary value of First Information Report in Access to criminal Justice in Pakistan. *Pakistan JL Analysis & Wisdom*, 3, 177.
- Naidoo, M., Baffi, S., & Aridhi, N. (2025). *Developing effective digital case management systems for labour dispute prevention and resolution institutions: Lessons learned from the ILO 2025 South-South and Triangular Cooperation workshop on digital case management systems*. ILO Working Paper. <https://www.econstor.eu/handle/10419/324264>
- National Commission for Human Development. (2022). *Digital divide in Pakistan: Access, literacy, and implications for justice*. NCHD.
- National Police Bureau Pakistan. (2023). *Crime statistics annual report 2022–23*. Ministry of Interior, Government of Pakistan.
- Ng, G. Y., Velicogna, M., & Dallara, C. (2020). *European Commission For The Efficiency Of Justice (CEPEJ)*.
- Pasquale, F. (2015). *The Black Box Society: The Secret Algorithms That Control Money and Information*. Harvard University Press. <https://doi.org/10.4159/harvard.9780674736061>
- Patel, S., Mukherjee, R. R., & Snigdh, S. (2020). Videoconferencing: An Emerging Concept in Courtroom. *International Review Of Law And Technology*, 1(1). https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3691427
- Piatyhora, K. V. (2023). E-justice in Administrative Process: European Standards and Foreign Experience. *Теорія і Практика Правознавства*, 2(24), 39–57.
- Rana, A. A., Gujjar, U. A., Ahmad, F. Z., & Naul, A. H. K. (2022). Admissibility and Evidentiary

- Value of Electronic Evidence in Criminal Cases: A Case Study of Pakistan. *JL & Soc. Pol'y*, 27.
- Richardson, R., Schultz, J. M., & Crawford, K. (2019). Dirty data, bad predictions: How civil rights violations impact police data, predictive policing systems, and justice. *NYUL Rev. Online*, 94, 15.
- Selbst, A. D., Boyd, D., Friedler, S. A., Venkatasubramanian, S., & Vertesi, J. (2019). Fairness and Abstraction in Sociotechnical Systems. *Proceedings of the Conference on Fairness, Accountability, and Transparency*, 59–68. <https://doi.org/10.1145/3287560.3287598>
- Shah, S. N. A. (2025). Global Trends To Use Artificial Intelligence In Law And Its Transformative Impact On Pakistan's Justice System. Available at SSRN 5581852. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=5581852
- Shahidullah, S. M. (2017). Modernization, Globalization, and the Emerging Challenges to Criminal Justice in South Asia: Editor's Introduction. In S. M. Shahidullah (Ed.), *Crime, Criminal Justice, and the Evolving Science of Criminology in South Asia* (pp. 1–33). Palgrave Macmillan UK. https://doi.org/10.1057/978-1-137-50750-1_1
- Silva, H. S. M. da. (2025). *Contextual Analysis of Case Law: Enhancing Precedent Identification with Artificial Intelligence*. <https://run.unl.pt/entities/publication/b71562ea-6419-4bb0-adb1-410bbf5cc594>
- Susskind, R. (2019). *Online courts and the future of justice*. Oxford University Press. https://academic.oup.com/book/41081?rskey=xGh7zx&result=44&itm_content=OxfordAc
- ud Din, S. J. (2024). Prospect of Using Technology to Enhance Access to Justice: Comparative Analysis between Pakistan and Indian Legal System. *Law and Policy Review*, 3(2), 139–170.
- UNDP Pakistan. (2023). *Access to justice in Pakistan: A diagnostic assessment*. United Nations Development Programme.
- World Bank. (2022). *Justice for all: An assessment of Pakistan's access to justice challenge*. World Bank Group.
- Zuboff, S. (2023). The age of surveillance capitalism. In *Social theory re-wired* (pp. 203–213). Routledge. <https://api.taylorfrancis.com/content/chapters/edit/download?identifierName=doi&identifierValue=10.4324/9781003320609-27&type=chapterpdf>