



ADVANCE SOCIAL SCIENCE ARCHIVE JOURNAL

Available Online: <https://assajournal.com>
Vol. 05 No. 02. April-June 2026. Page# 717-734
Print ISSN: [3006-2497](https://doi.org/10.3006-2497) Online ISSN: [3006-2500](https://doi.org/10.3006-2500)
Platform & Workflow by: [Open Journal Systems](https://openjournal.org)



Artificial Intelligence in Predictive Policing In Pakistan: A Qualitative Analysis of Legal, Ethical, And Institutional Challenges

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ABSTRACT

The role of AI in law enforcement has grown significantly over the years, especially with the advent of predictive policing models that aim to improve crime prevention and resource distribution. This study discusses the legal, ethical and institutional issues surrounding the creation and application of AI predictive crime prevention models in Pakistan. Data was collected using qualitative research approach and analyzed using thematic analysis, in-depth interviews were conducted with legal experts, law enforcement officials, and technological specialists. The findings indicate that while there is great potential for Pakistan to leverage AI to enhance policing effectiveness, the current legal framework, which mainly comprises the Prevention of Electronic Crimes Act 2016, is inadequate to govern AI systems, including in terms of data privacy, algorithmic accountability and transparency. The study also sheds light on the important issues concerning surveillance practices, algorithmic bias, absence of informed consent and threats to the constitutional right to dignity of humans. The stakeholders highlight the need for a well-defined regulatory framework to ensure that AI technologies are used in an ethical and legal manner, which includes the proposed Personal Data Protection Bill 2023. The study finds that a combination of legal changes, technical measures, institutional controls, and interdisciplinary cooperation is necessary to make AI-driven predictive policing effective while respecting the rights of individuals and promoting technological advances in crime prevention.

Keywords: Artificial Intelligence, Predictive Policing, Crime Prevention, Data Privacy, Algorithmic Bias, Legal Framework, Pakistan, PECA 2016, Data Protection, Ethical AI

1. INTRODUCTION

Artificial Intelligence (AI) has revolutionized the dynamics of governance and criminal justice in the modern era, providing a suite of predictive tools to aid decision-making in the field of law enforcement. AI-based predictive policing relies on patterns observed in past crimes and algorithms that leverage machine learning to predict future criminal activity and optimize the

allocation of resources for crime prevention (Shetti, 2023; Mugari & Obioha, 2021). Several countries have implemented such systems to improve the efficiency of the police (e.g., the United States, the United Kingdom, Germany, and the Netherlands), but several studies have reported significant issues related to privacy concerns, algorithmic bias, transparency and lack thereof, and discrimination against marginalized communities (Gstrein et al., 2019; Kamiran et al., 2012).

Although the adoption of AI in the Pakistani context is still in its nascent stage, there are signs of interest in predictive technologies in the country, including the implementation of the Face Tracing System by the Punjab Police and the use of AI for surveillance by the Police Department of Khyber Pakhtunkhwa (Khan, 2023; Choudhary, 2023). The lack of a dedicated legislation for AI based predictive policing, restricted scope of Prevention of Electronic Crimes Act (PECA) 2016 and inadequate data protection systems, however, still have significant gaps in the law and ethics (Khan, n.d.). The right to privacy and dignity as enshrined in the Constitution and guaranteed in Article 14, presents challenges when it comes to ensuring algorithmic accountability, transparency and to protect against biased or discriminatory algorithmic decisions. This study thus explores the legal, ethical and technical challenges of AI predictive policing in Pakistan from the lens of key stakeholders and suggests a balanced framework that promotes advancement of technology while safeguarding fundamental rights.

1.2 RESEARCH QUESTION

1. What are the major legal and ethical issues faced by the development and application of predictive models for crime prevention using AI in Pakistan?
2. What are the views of legal, law enforcement and technologic experts on the use of predictive policing models based on AI and privacy, accountability, transparency, and individual rights?
3. What legal, technical and institutional arrangements are required to be in place to ensure that AI based predictive models are used ethically and responsibly for crime prevention in Pakistan?

2. LITERATURE REVIEW

In today's societies, Artificial Intelligence (AI) has proven to be a game-changer, having enhanced and embedded AI-based computational systems within governance, security, and decision-making frameworks. The key point scholars highlight is the ability of AI to mimic human intelligence by analyzing vast amounts of data, detecting patterns, and aiding prediction in decision-making processes, as seen in various industries (McCarthy, 2019; IBM, 2023). Caldwell et al. (2020) have argued that AI has transformed societal systems by bringing together spatial, biometric, and behavioral data and facilitated innovations, including the creation of city maps and identity verification. Predictive AI systems are being deployed more and more in the field of crime prevention, helping to predict crime and guide proactive policing. (Shetti, 2023). AI technologies are also highlighted as a means for situational crime prevention (SCP) in an urban context, as suggested by Hassan (2022), who connects the two theories. Hassan (2022) also ties situational crime prevention theory to AI technologies, which include CCTV surveillance, behavioral biometrics and movement tracking as a way to decrease crime rates in urban areas. But the technological developments are urgently calling for regulatory action, as reported at the AI Policy Summit (2023), in order to guarantee responsible and ethical implementation in a digital environment that is rapidly changing.

Predictive Policing is deployed globally to improve the efficiency of police work, including in countries like the Netherlands and Germany. In the Netherlands, the Crime Anticipation System (CAS) and in Germany the PreMAP system developed through cooperation between IBM and Karlsruhe Institute of Technology, are examples of such systems used to predict hotspots of crime based on spatial and temporal information (Mugari & Obioha, 2021). Likewise, UK and US police services have tried out software created by companies like PredPol and Palantir, but a few of these were scrapped over monetary and moral worries (Mugari & Obioha, 2021). These systems have been effective at decreasing burglars and theft, but researchers warn that if not implemented with care, they can exacerbate social inequalities. The possibility of algorithmic systems being developed from biased data that can result in discriminatory outcomes is highlighted by Kamiran et al. (2012), who also point to the high stakes of fairness in criminal justice systems and the concern of those who are marginalized.

Predictive policing continues to be a topic in the academic literature that has been fraught with ethical and legal issues. Gstrein et al. (2019) explain that in many jurisdictions, there are no comprehensive laws addressing privacy concerns, algorithmic discrimination and the use of opaque decision making processes. They point out that predictive policing frequently uses “big data” and automated applications that are “black boxes” that are hard for people to understand how they are generating decisions (Investopedia, n.d.). In addition, there are existing protocols, for example, the Charter of Fundamental Rights of the European Union (CFEU) and the General Data Protection Regulation (GDPR), which offer limited protection against group-based surveillance and algorithmic profiling as mentioned by Gstrein et al. (2019). They emphasize the need for transparency, accountability, and trust in AI governance between states and citizens to avoid such misuse of AI technologies in policing systems.

Technically, predictive AI models use historical data and machine learning algorithms, along with feature extraction methods, to detect patterns, and predict future crime events (Shah et al., 2021). Such systems can examine data on demographics, geography, time, and crime history to identify patterns and trends that can help identify potential crime hotspots. The accuracy of their predictions, however, relies heavily on the quality and completeness of the input data, with poor or flawed data leading to inaccurate predictions (Shah et al., 2021). According to Shetti (2023), predictive AI systems are constantly evolving using machine learning and can now predict future events in areas like crime prevention, healthcare, and even marketing. While these benefits exist, the lack of transparency arises in many systems where the algorithms are not interpretable and it is difficult for stakeholders to understand the decision making process or the system to be accountable in sensitive areas such as policing.

The use of AI in the Pakistani police has recently taken off but is still in its fledgling stages. The Khyber Pakhtunkhwa Police has been using AI-based surveillance systems with facial recognition technology, and the Punjab Police has adopted the Face Tracing System (FTS) in conjunction with the National Database and Registration Authority (NADRA) for suspect identification (Khan 2023; Choudhary 2023). The developments reflect growing dependence on predictive technologies to fight crime and investigate it. But Pakistan has no proper legal framework in place that regulates the AI-based systems. The current legislation, including the 2016 Prevention of Electronic Crimes Act (PECA), is mainly focused on cybercrime, whereas algorithmic decision making and large-scale data analytics (LSDA) are not covered. (Khan, n.d.) The Constitution of Pakistan provides the right to privacy and dignity to the individuals under Article 14 but there is no specific legislation protecting data, which means there is significant legal uncertainty around consent, surveillance and the use of data in predictive policing systems.

Additionally, the literature points to the risks of AI in criminal justice systems, including the potential for misuse of data, algorithmic bias, and violations of due process. Furthermore, the literature identifies a number of significant risks, such as the potential for misuse of data, algorithmic bias, and violation of due process. According to Mugari and Obioha (2021), predictive policing could lead to mis-prediction, police misconducts, and perpetuation of societal inequalities. They also point out that although predictive models can enhance the allocation of resources and crime detection, there are constraints in terms of technology and ethics. Kamiran et al. (2012) are also able to show the necessity of discrimination-aware data mining methods to diminish the biasness in algorithmic decision making systems. The implementation of AI systems in Pakistan's national databases adds a layer of complexity, making it even more critical to keep the systems safe and secure. The use of AI systems in sensitive national databases further exacerbates the concerns in Pakistan, as unauthorized access and misuse can have serious consequences. Gstrein et al. (2019) also note that predictive policing, if not properly accompanied by meaningful accountability measures, can disproportionately affect vulnerable communities, thereby breaching fundamental rights under international and constitutional law. However, the prospects of using AI-powered predictive systems for crime prevention are promising, as long as they are used responsibly. When supported by transparent governance systems, predictive policing has the potential to augment crime predictions, inform the most effective policing strategies and enhance public safety, as stated by Mugari and Obioha (2021). Additionally, Shah et al. (2021) note how AI systems could support law enforcement agencies to detect crime patterns and enhance investigative efficiency. The establishment of the Draft National AI Policy and the proposed Personal Data Protection Bill 2023 are significant developments in the ongoing efforts to fill the regulatory gaps in Pakistan (Ministry of Information Technology and Telecommunication, 2023; Durrani, 2023). Durrani (2023) also notes that the implementation process might encounter difficulties, awareness of the problem may be low, and the enforcement process may be weak. Overall, the literature indicates that AI has great potential to modernise crime prevention systems, but the ability of this tool to achieve positive outcomes will require robust legal frameworks, ethical protections and accountability mechanisms within institutions.

3. RESEARCH METHODOLOGY

The methodology used in this study was qualitative research as it aimed to explore the legal and ethical implications of AI-driven crime prediction technologies in Pakistan. Qualitative research is suitable when the goal is to learn more about experiences, perceptions, and complex social phenomena which cannot be quantified (Creswell & Creswell, 2014). In the context of under-explored and emerging nature of AI-based predictive policing within the Pakistan legal framework, a qualitative method was used to allow for detailed and contextual understanding of the phenomenon (Kumar, 2014). Semi-structured in-depth interviews were the main method used in the study as in-depth interviews provide the researcher with the flexibility of exploring a variety of perspectives while keeping the discussion on a specific theme (George, 2023). The sampling technique employed was a purposive sampling technique, which was used to select the participants who have specialized knowledge in relation to the objectives of the research (Kumar, 2014). Participation in the study was limited to six persons from three domains: legal, law enforcement, and technological. Interviews were done both face to face and online, and the data were analysed using thematic analysis of responses. Thematic analysis helped the researcher identify common themes, patterns and interpretations regarding legal gaps, ethical concerns, algorithmic bias, and governance concerns in AI-based predictive policing (Strauss, 1987).

Participants' confidentiality and anonymity was ensured by omitting names and using codes and labels during data processing to meet ethical standards for research (Bell et al., 2022).

Table:1 Participants of Research Methodology

S.No	Participant Category	Code	Designation/Role	Area of Expertise
1	Legal Expert	RLE1	Judge	Judicial Perspective and AI Regulation
2	Legal Expert	RLE2	Lawyer	Constitutional Rights and Privacy Laws
3	Law Enforcement Official	RLEO1	Inspector Police	Crime Prevention and AI Operations
4	Law Enforcement Official	RLEO2	Superintendent Police	Cybercrime and Investigation
5	Technological Expert	RTE1	Engineer/Academician	Artificial Intelligence and Machine Learning
6	Technological Expert	RTE2	Academician	Data Science and Predictive Analytics

4. DATA ANALYSIS

Thematic analysis was used to analyse the collected qualitative data, a systematic process for identifying, coding, categorizing and interpreting patterns in qualitative data (Strauss, 1987). The responses received during the interviews were meticulously transcribed and categorized thematically to understand the key concerns regarding legal aspects, data privacy, accountability, transparency, and ethical implications of AI-driven predictive models in Pakistan. Responses gathered from participants were coded and labelled to enhance their clarity, consistency and interpretation (Creswell & Creswell, 2014). Thematic analysis also helped the researcher to interpret the complex narratives of the legal experts, the police and the technological experts in relation to AI governance and to the uses of predictive policing (Kumar, 2014).

Table:2 Participants Used in Data Analysis

S.No	Participant Code	Domain	Focus of Analysis
1	RLE1	Legal Expert	Legal framework and judicial oversight
2	RLE2	Legal Expert	Privacy rights and constitutional protections
3	RLEO1	Law Enforcement Official	Predictive policing and operational challenges
4	RLEO2	Law Enforcement Official	Cybersecurity and AI implementation
5	RTE1	Technological Expert	AI model development and algorithm bias
6	RTE2	Technological Expert	Data protection and technical safeguards

4.1 THEMATIC DEVELOPMENT IN LEGAL EXPERTS' PERSPECTIVES

4.1.1 EXISTING LAWS AND REGULATIONS IN PAKISTAN TO ADDRESS THE DEVELOPMENT AND DEPLOYMENT OF AI-BASED PREDICTIVE MODELS:

In general legal experts have mentioned that yet there is no law which meets the challenges of artificial intelligence technology. RLE1 stated in order to ensure ethical and

responsible use of AI, up skill human capital in AI and related technologies, guide investment in AI research and development, and provide a framework for the development of AI-based solutions, the Draft National Artificial Intelligence Policy seeks to raise public awareness of the use of AI-based platforms while maintaining privacy. However, RLE1 also indicated that this draft did not contain any particular clause for using of personal data by agencies of state for the purpose of security. The RLE2 claimed that there are already rules and regulations pertaining to technology, security and data protection, their specific application to artificial intelligence (AI) is still in its infancy and subject to interpretation. Potential loopholes in current legislation, he said that:

–The 2016 PECA (Prevention of Electronic Crimes Act) lacks specific measures for controlling AI models used in crime prevention and focuses mostly on cybercrimes. The 2023 Personal Data Protection Bill is still pending. Although it suggests frameworks for data protection, it is unclear what this means for AI-driven procedures that handle personal data.”

4.1.2 LEGAL HURDLES IN CREATION OF AI-BASED PREDICTIVE MODEL:

The main problem indicated by RLE1 was the absence of legal framework which shows the huge vacuum of legal precedents regarding AI-based model. He emphasized the necessity for explicit laws that address AI-based crime prediction, specify acceptable data gathering procedures, provide due process protections when using model outputs, and clearly define who is responsible for what.

Robust data protection regulations are essential to any legal framework, according to RLE2. Strong protections against unauthorized data collection, archiving, and use are required. Informed consent must be given first priority, and the procedure must be transparent. Failing to do so could lead to public mistrust and breach fundamental rights to privacy. RLE2 emphasized that the right to privacy is a basic right guaranteed by the Islamic Republic of Pakistan's Constitution. "The dignity of man and, subject to law, the privacy of home, shall be inviolable," Article 14(1) of the Constitution.

4.1.3 DEFICIENCIES RELATED TO DATA PRIVACY, INDIVIDUAL RIGHTS AND ALGORITHM BIAS:

The right to privacy is guaranteed by the Pakistani Constitution as one of the essential rights, according to RLE1, which indicated that the legal system in the country does offer a basis for resolving concerns pertaining to data privacy and individual rights. The RLE1 enlightened that the right to privacy may be considered a part of the individual dignity protected by Article 14 of the Constitution. However, it might be difficult to modify these laws to account for the complexities of AI technology. The absence of clear rules addressing algorithmic bias may present specific legal challenges, raising questions about fairness and potentially discriminatory consequences.

RLE2 asserted that utilization of AI to forecast and perhaps pre-empt criminal action risks violating due process rights, especially when predictions are erroneous or biased. It is quite concerning when people's rights are violated or their liberty is taken away from them because algorithmic predictions are used without the necessary legal justification. REL2 stated that

“As a lawyer in Pakistan, I stand cautiously optimistic about the potential of AI-based crime prediction models to enhance public safety. However, my

professional oath compels me to raise the alarm bells ringing loudly in the legal labyrinth surrounding this technology”.

RLE1 and RLE2 both are of opinion that there is a glaring vacuum in Pakistan's protections against unauthorized data collection, analysis, and possibly even profiling because there is no comprehensive data protection legislation in place. According to RLE1 —*We don't have the right systems in place to guarantee data minimization, informed consent, and openness in algorithmic procedures*||. RLE1 and RLE2 have also asserted that AI development is based on modeling data and if such data is trained on human prejudices then it would lead to unfair targeting. Lastly, both agreed that these deficiencies are not insurmountable roadblocks, but rather urgent calls to action, emphasizing fairness, transparency, and human oversight.

4.1.4 ENSURING ACCOUNTABILITY AND TRANSPARENCY

RLE1 clearly stated that proper legal framework regarding the development and implementation of AI-based predictive model is needed. This entails identifying the range of applications for AI, outlining the kinds of decisions it can affect, and putting in place accountability measures for both the system creators and users. According to RLE1,

“When people feel that choices made by AI have harmed them, legal systems ought to include mechanisms for appeal and reparation. To do this, easily accessible channels must be established so that impacted parties can contest choices, look for justifications, and ask for changes. Legal systems can achieve a balance between utilizing AI to improve law enforcement skills and holding people accountable for its moral and legal use by implementing these steps.||

RLE2 stated that

“I would stress the significance of responsibility and openness when incorporating AI prediction models into legal judgments. The creation, training, and implementation of AI systems must be transparent, according to legal frameworks. The disclosure of algorithms, data sources, and decision-making techniques by law enforcement authorities is one aspect of this.”

Both RLE1 and RLE2 were of the opinion accountability and transparency can be maintained only if there is check and balance of system. For that there must be cautious audit of AI-based model which uses for determining the crime before being committed.

4.1.5 ROLE OF JUDICIARY ENSURING THE ETHICAL USE OF AI-BASED PREDICTIVE MODEL FOR CRIME PREVENTION

The judiciary can be extremely important in monitoring and guaranteeing the moral application of AI-based prediction models for Pakistani crime prevention. According to RLE1, the judiciary can set up monitoring procedures and regulatory frameworks to keep an eye on how AI-based prediction models are used in law enforcement decisions. By doing this, it may be possible to guarantee that the models are applied morally and sensibly and that citizens' rights to privacy and individuality are respected. RLE1 proposed that norms and criteria for the application of AI-based prediction models in law enforcement decision-making may be set by the judiciary. The kinds of information that can be used, the kinds of choices that can be taken, and the kinds of results that can be anticipated are some examples of these guidelines.

As noted by RLE2, transparency should be given top priority in legislation and regulations governing AI-based models for crime prevention. This is in contrast to the Pakistan Electronic Crime Act, 2016, whose drafting has several flaws. Like sections 31, 32, 37, and 42 of the PECA give government agencies broad authority, which raises the possibility of a breach of fundamental rights, as RLE2 explicitly pointed out.

4.2 THEMATIC EXPLORATION IN LAW ENFORCEMENT OFFICIALS' PERSPECTIVES

4.2.1 OPINION ON ENVISIONING THE INTEGRATION OF AI-POWERED PREDICTIVE MODELS IN LAW ENFORCEMENT OPERATIONS:

Predictive models, according to RLEO1, can identify places where crimes are more likely to happen by analyzing demographics, environmental factors, and previous crime data. In order to prevent possible criminal action before it occurs, this enables us to proactively deploy patrols and resources. RLEO1 explained the purpose of forecasting particular crime categories, such as robberies, burglaries, or drug trafficking, models could examine historical data and find trends.

According to RLEO2, facial recognition and social media analysis algorithms used in artificial intelligence (AI) could help investigators identify people with criminal histories or those who appear to be preparing illegal acts based on their online activity. This information might be crucial for targeted inquiries and efforts meant to deter criminal activity without police brutality. Reaching the wanted criminals was aided, according to RLEO2.

4.2.2 OPPORTUNITIES AND CHALLENGES IN THE IMPLEMENTATION OF PREDICTIVE MODEL FOR CRIME PREVENTION IN PAKISTAN

AI possibilities like proactive crime prevention were highlighted by RLEO1. He stated that *"Accurately identifying crime hotspots, categories, and potential suspects may help us effectively allocate resources to prevent crime before it occurs."*

RLEO1 enlightened that the highest-profile cases, including as the Zainab and Motorway rape cases, have been solved by Punjab Police IT division using AI-powered prediction and DNA profiling that matches databases.

RLEO2 mentioned that Pakistan Police is employing AI-predictive model which work on capturing, extracting, comparing and matching algorithms to arrest the culprits before the commission of crime. RLEO2 reported that wanted criminals were apprehended with the use of the *"AUTOMATED FINGER SYSTEM IDENTIFICATION"* mega-matcher. He also explains how digital evidence started to be used as primary evidence in court proceedings after ETO 2002. Digital data, audio, and video evidence may be examined more rapidly and effectively by AI-powered tools, which can also help with cybercrime investigations, predict the behavior of offenders, and link suspects to crimes.

AI is not a magic wand, as RLEO1 made clear. It can be challenging to comprehend how certain AI models arrive at judgments and hold them responsible for mistakes due to their opaque nature. To preserve public confidence and guarantee responsible use, model creation must be transparent, and human control must be in place.

Based on her extensive knowledge in the field of investigation, RLEO2 emphasized on

"Establishing public confidence in AI-powered crime prediction models is essential to their effective deployment. Furthermore the employment of AI raises ethical problems about pre-emptive interventions based on

predictions, potential violation of due process rights, and the dehumanization of crime prevention."

RLEO2 stated the biggest challenge in the implementation of AI-based predictive model is to re-aligning the technical experts and legal experts on same footing.

4.2.3 POTENTIAL RISKS OF DATA MISUSE BY ANTI-STATE ACTORS

As a law enforcement officer in Punjab, RLEO1 asserted,

"We are totally dedicated to putting in place robust safeguards to prevent any unauthorized access, maintain data security, and handle any potential threats posed by individuals or groups hostile to our government. Legal side is that data is linked with the safe city cameras (CCTV) project which operates under the government."

RLEO2 firmly stated that the police prioritize using data to apprehend criminals than abusing it. But since technology is not infallible, there is always a chance of cyber-attacks and data leaks. National Cyber Security Policy 2021, which calls for the development of a national cyber security response framework, was approved by the Pakistani government, according to RLEO2. An appropriate Cyber Governance Policy Committee has been established to oversee the policy's execution. With the phrase "act of aggression against national sovereignty," the regulation will impose severe penalties on cyber-attacks that target any governmental institution. Along with preventing financial chaos, it will also concentrate on combating all kinds of mishaps involving the improper use of data and other relevant communication tools. A Cyber Patrolling Unit (CPU) has been established by the Federal Investigation Agency (FIA)'s Cybercrime Wing in accordance with the aforementioned guideline in order to monitor what is trending on digital world.

4.2.4 EFFECTIVE AND RESPONSIBLE USE OF AI-BASED PREDICTIVE MODEL BY LAW ENFORCEMENT EMPLOYEES

According to RLEO1 and RLEO2, law enforcement personnel should receive specialized training on AI technology in order to understand both its advantages and disadvantages. To ascertain their effectiveness and address any problems, AI systems should be routinely assessed and observed. The use of AI in law enforcement must be governed by ethical rules, even if RLEO1 made clear that there are none for officials.

RLEO2 indicated that cooperation and coordination with institutions at all levels would continue in order to improve work flow in activities in this regard. He went on to say that,

"The Punjab Police completely cooperates with the Justice System Support project (JSSP) of the British High Commission for Improving the Criminal Justice System and Investigation System in its efforts and initiatives, calling it a valuable project called „Rule of Law Reform“."

The responsible use of AI prediction models, RLEO2 continued, requires interaction with a range of stakeholders, such as law enforcement, investigators, and pertinent support personnel, in order to obtain information and guarantee that their viewpoints are taken into account throughout the integration process.

4.2.5 COLLABORATION BETWEEN LAW ENFORCEMENT OFFICIALS AND TECHNOLOGICAL EXPERTS

RLEO1 said that "joint training programs that bring law enforcement officials and technical experts together will facilitate mutual understanding of each other's roles,

expertise, and potential challenges." He mentioned the delegation of Pakistani police officials that recently visited China to learn about the use of drone technology in investigations. RLEO1 reported that "IG Punjab Dr. Usman Anwar said that Punjab Police will send ASPs to Police Training College in China for operational and investigation training, which will equipped them with modern policing methods, effective use of new technology and further improvement in eradication of crimes and public service delivery." RLEO2 highlighted those building interdisciplinary teams that comprise both law enforcement personnel and technical specialists. The use of AI models will profit from a variety of viewpoints and expertise thanks to this cooperative approach. He also mentioned that the Crime Investigation and Prevention Lab (CIPL), in Lahore is dedicated to conducting research developing solutions and implementing data driven approaches in areas related to crime prevention. These include uncovering crime patterns and optimizing surveillance gathering evidence and identifying suspects analyzing speech forensics and predicting vulnerabilities in order to prevent crimes. The lab aims to bring experts from fields such as data science, criminology, sociology, speech and audio processing well as law enforcement agencies (LEAs) with the goal of establishing an advanced center for maintaining law and order. This showcases the Pakistan Police Departments commitment to collaborating with professionals.

As per the opinions expressed by RLEO1 and RLEO2, collaboration between LEAs and technical experts might aid in detecting and reducing biases in AI models. Law enforcement professionals offer their subject knowledge to resolve any prejudices that may occur in real-world circumstances, while technical specialists can design methods for bias identification.

4.3 THEMATIC DEVELOPMENT FROM TECHNOLOGICAL EXPERTS

4.3.1 DATA COLLECTION FOR AI-BASED PREDICTIVE MODEL IN PAKISTAN

As per RTE1, identifying the data modality is necessary for gathering and analyzing digital records. Most often, relational databases are used to collect data. However, the main organization in Pakistan for collecting and maintaining citizen data is the National Database and Registration Authority (NADRA), which is used by government departments. Many techniques are employed by them, such as biometric and demographic information on Pakistani individuals is collected throughout the National Identity Card (NIC) registration procedure.

In addition to using NADRA, RTE2 disclosed that the government also uses other records, including FBR tax filings, mobile apps, and internet data, to obtain information about residents. The information provided by RTE2 also revealed that CCTV video, surveillance systems, investigation records, and crime reports are some of the ways the police and other law enforcement authorities gather information. Moreover computerized toll collecting systems and traffic cameras on motorways now use AI-based systems to gather data on license plate readings and vehicle movements automatically.

4.3.2 PROCESSING CRIMINAL RECORD FOR AI-BASED PREDICTIVE MODEL

According to RTE1, criminal histories are obtained from the police and are categorized based on certain criteria. For example, the day, the hour, and the nature of the crime; crimes against people, property, or the state. The crime scene is depicted and data visualization analysis takes place thereafter. At the end, these are arranged into clusters. When risk identification becomes necessary, algorithms are added at the end. Crime risks

related to various crime kinds, locations, and dates are identified using the clustering approach.

Criminal records are kept in recurring patterns, RTE2 retorted. By concentrating on particular crime categories that are pertinent to Pakistan, such drug trafficking, domestic abuse, and street robberies, customized models can produce predictions that are more accurate. And in the field of crime prevention, he continued, a predictive model is a learning tool.

4.3.3 CHALLENGES AND LIMITATIONS IN DEVELOPING AND DEPLOYING ROBUST AI-BASED CRIME PREDICTION MODELS

As a specialist in artificial intelligence for the past ten years, RTE1 said,

"I assume that Pakistan has many difficulties when creating AI-based models to deter crime. The data challenges come first and foremost. For example A) Data Availability and Quality: Building robust models requires accurate and extensive data regarding prior crime events, demographics, socio-economic factors, and environmental conditions. Sadly, Pakistan frequently has inconsistent, partial, and fragmented data. It is imperative to create centralized databases and address concerns with data quality. B) Fairness and Bias: Training data might reinforce preexisting societal biases, resulting in predictions that are biased against particular neighborhoods or populations. We need to reduce bias via methodical data selection, computational tweaks, and ongoing watchfulness. C) Concerns about privacy: Significant privacy problems are raised by the gathering and analysis of vast volumes of personal data.

To safeguard the public and prevent abuse, powerful anonymization methods, well-defined regulatory frameworks, and effective data protection protocols are necessary."

RTE2 concentrated on the limitations and constraints of the models, such as the fact that many AI models' internal workings are opaque, making it challenging to comprehend how they make their predictions. This lack of openness can undermine public confidence and give rise to questions about responsibility. It's essential to create AI models that make sense and to provide precise instructions on how to use them. Furthermore, according to RTE2, the quality of CCTV coverage affects the possibility of false positives. It can be tempting to base all of your resource allocation and decision-making decisions on AI projections. RTE2 also asserted that relying too much can result in disregarding human judgment and experience.

4.3.4 ENSURING TRANSPARENCY IN DATA COLLECTION

As a technological specialist in Pakistan, RTE1 stated, *"I believe that being transparent about data collection is essential to using technology in a responsible and ethical manner."* Between the public, governments, and corporations, as well as other technology players, transparency fosters confidence. Ethical boards and committees in Europe and America assess the data gathering protocol. Unfortunately in Pakistan yet such boards do not exist and government does not have any sort of regulation on collected data.

RTE2 emphasizes the need for autonomous regulators for AI-based predictive models. It is essential to have clear and thorough privacy rules. People ought to know how their

information is gathered, put to use, and safeguarded. People are better able to make educated decisions about sharing their information because of this transparency. The creation of an AI regulatory directorate to guarantee the moral and responsible application of AI is one of the proposals included in the *Draft National AI Policy*. This involves making sure AI is utilized responsibly and transparently, and that it isn't used to discriminate against people or groups.

4.3.5 TECHNICAL SAFEGUARD AGAINST POTENTIAL DATA MISUSE

From a technical standpoint, RTE1 proposed that data encryption both in transit and at rest guards against manipulation and unwanted access. While maintaining statistical insights, controlled noise can be added to data sets to safeguard individual anonymity. One way to lower the danger of single points of failure and data breaches is to distribute training data across different devices without centralizing it.

The government check and balance on the AI-based predictive model, which RTE2 discussed, will prevent any employee from misusing data. Conduct independent audits and assessments of AI systems on a regular basis to evaluate their ethical compliance, fairness, and transparency. To ensure public accountability and confidence, establish procedures for public involvement and monitoring of AI development and deployment. Lastly, create legislative frameworks that prohibit discriminatory behaviors, safeguard individual rights, and govern the use of AI for monitoring and control.

4.4 CROSS-COMPARISON OF LEGAL, LAW ENFORCEMENT AND TECHNOLOGICAL EXPERTS ON AI-BASED PREDICTIVE MODEL

4.4.1 STAKEHOLDERS' PERSPECTIVES ON DATA COLLECTION

RLE1 and RLE2 concentrated on making sure that data gathering procedures adhere to relevant legal requirements as well as ethical guidelines. RLE1 emphasized that obtaining data without citizens' agreement is against their constitutional right to privacy, which is protected in Article 14(1). Fair and legal data collection practices are crucial, as stressed by RLE2. Data protection legislation is lacking, according to RLE1 and RLE2. Regarding the keeping of personal data by governmental actors, PECA 2016 and ETO 2002 are not sufficiently explicit. A legal framework governing the kinds of data that can be gathered, the uses for which it can be put to use, and the rights of persons over their data is vital. RLE1 and RLE2, however, provide positive feedback regarding the Ministry of Information Technology and Telecom's (MOITT) recent introduction of the National AI Policy, which ensures the wellbeing of citizens.

The primary goals of RLEO1 and RLEO2 were to gather information about criminal activity, investigations, and public safety. It depends on a number of sources, including government documents, witness accounts, safe city cameras (CCTV), surveillance film and internet online information irrespective of the privacy. The focus is on obtaining the data needed to keep the peace.

The General Data Protection Regulation (GDPR), an international standard for data collecting that is used worldwide, was generally viewed by RTE1 and RTE2 as requiring compliance with data collection. According to their description, data gathering covers a wide range of activities, such as data collection for innovation, system optimization, and AI development. It uses a variety of techniques, including sensors, surveys, and smartphone apps, to collect data which increases operational efficiency and propel technical developments through the use of data.

4.4.2 STAKEHOLDERS' PERSPECTIVES ON DATA PRIVACY

RLE1 and RLE2 advocated for open and honest communication with people regarding the gathering, handling, and use of personal data. Data privacy is not a concern for law enforcement authorities, as there is no clear legal structure addressing. Legal professionals express concern about unauthorized access, data breaches, or leaks that may jeopardize personal data and result in identity theft, financial fraud, or invasions of privacy. These are all in opposition to the constitutional right. Laws must make sure businesses offer consent procedures, terms of service, and privacy policies that are easy to read and comprehend. Legal professionals can have a significant impact on the development of legislative frameworks that require data gathering techniques to be transparent.

According to RLEO1 and RLEO2, law enforcement officials are not supposed to abuse any personal data. Their main aim is to prevent crime and reach the culprits. The data is used for the welfare of the citizens. Therefore data is protected in safe hands. However, a law enforcement official seems unprepared for adverse attacks on system.

Research ethics boards typically establish protocols for data gathering, and RTE1 and RTE2 noted that privacy of the data is taken into consideration. As previously said, uncertainty over the gathering, storing, and utilization of data by law enforcement organizations is unfortunately brought about by the lack of strong data protection legislation. This can lead to inconsistent procedures and raise concerns about potential privacy infringement.

4.4.3 STAKEHOLDERS' PERSPECTIVE ON DATA MISUSE

Private information was exposed due to data misuse, which was brought to light by RLEO1 and RLEO2. However, strong data privacy procedures have been implemented as part of government public monitoring programs. The government has made significant progress in this regard by enacting the Prevention of Electronic Crimes Act (PECA), 2016, which lays out penalties for offenders or reprobates who are suspected of gaining unauthorized access to personal information. Through its National Response Center for Cybercrime (NR3C), the Federal Investigation Agency (FIA) also enacts laws pertaining to penalties under the PECA.

Both RTE1 and RTE2 felt that the FIA cyber cell needed to implement strong cyber security measures, encryption, and access controls to safeguard user data. According to technology experts, in order to detect and correct vulnerabilities, government IT specialists must undertake security audits and assessments. That adheres to ethical principles when creating AI, incorporating user permission and privacy-preserving mechanisms in line with GDPR (General Data Protection Regulation).

4.4.4 STAKEHOLDERS' PERSPECTIVE ON COLLABORATION AMONG LEGAL EXPERTS, LAW ENFORCEMENT OFFICIALS AND TECHNOLOGICAL EXPERTS

Developing and testing the integration of these technologies necessitates a contemporary and resilient infrastructure, a fact underscored by RTE1. The Punjab Information Technology Board (PITB) and the National Information Technology Board (NITB) are working to create these kinds of systems. It is known that the process of implementing these technologies for real-time services is gradual. As RTE1 pointed out, ongoing cooperation with law enforcement personnel is crucial for data validation. This

partnership guarantees that the AI models' underlying data is up to date and accurate. In order to assess the defense of citizens' rights and offer recommendations for the creation of a strong legal framework, legal experts must also be involved. Technical specialists, law enforcement officers, and legal professionals must work together at different phases of the process, from creating systems and training stakeholders to validating data and guaranteeing legal compliance. These partnerships are essential to the successful implementation and continuous development of AI-based predictive models for crime prevention.

Working together is crucial, according to RLE1 and RLE2 Legal, to guarantee the legal creation and application of AI-based prediction models. They consider their responsibility as advising on how to harmonize legal frameworks with technological innovations, safeguarding individual rights, and upholding the integrity of the law. Without collaboration, significant accomplishments are impossible, according to RLEO1, which underlined the need of teamwork in both traditional and technological contexts. It is imperative that provinces work together to achieve their goals in crime prevention, he added. The value of teamwork was demonstrated by specific instances given by RLEO2, in particular, the cooperation between the IT departments of the Punjab and KPK police agencies. Face Tracking System (FTS) and the first AI-powered security system were successfully installed as a result of these partnerships. These programs demonstrate the measurable results that may be obtained by joint efforts in the fields of technology and law enforcement. KP- Inspector General Akhtar Hayat Khan marked that

"AI will revolutionize the investigation process, which traditionally relies on retrieving footage from CCTV cameras, often leading to delays and obstacles. The new AI system will provide for real-time access to vital information, facilitating prompt action and the arrest of offenders."

4.4.5 STAKEHOLDERS' PERSPECTIVE ON ETHICAL CONCERNS

Concerns are raised by legal experts RLE1 and RLE2 over the Pakistan Electronic Crime Prevention Act's ambiguity and the lack of a legislative foundation for AI. Concerns mostly center on ethical issues, including the lack of individuals' express agreement for the collection and use of their personal data. Currently, a wide range of data is available to law enforcement official that includes data pertaining to biometric security measures, computerized national identity cards, passports, bank accounts, credit/debit cards, and access control. This is a breach of the inviolable dignity that each and every person is entitled to under Article 14(1), according to RLE1.

Furthermore, the lack of checks and balances in algorithm explainability is a critical concern stated by RTE1. The way these algorithms are constructed makes it impossible to understand how they work; to stakeholders other than IT specialists, they operate like a black box. This lack of openness erodes the public's faith in law enforcement organizations. The practice of anticipatory arrests is regarded by legal professionals as a human rights infringement. In the absence of concrete evidence, such actions take on a questionable moral character and may even infringe upon civil liberties. Advocates of legal caution argue that a prudent strategy should balance the use of AI to deter crime with the defense of human rights and moral standards. Conclusively, the general public's trust in law enforcement agencies is damaged by this lack of transparency. Legal experts view the practice of anticipatory arrests as a violation of human rights. Such acts assume a dubious moral aspect and may even violate civil freedoms in the absence of hard proof.

Legal caution proponents contend that a wise approach should strike a balance between the protection of moral principles and human rights and the use of AI to deter crime.

5. FINDINGS OF THR STUDY

5.1 FINDINGS FOR RESEARCH QUESTION 1: PRIMARY LEGAL AND ETHICAL CHALLENGES IN AI-BASED PREDICTIVE POLICING IN PAKISTAN

The findings suggest that the most critical legal hurdle in the creation and application of AI predictors for crime prevention in Pakistan is the lack of a holistic and specialized legislation on AI. The current legal framework cover digital crimes and issues with electronic data only partially, without explicit provisions for AI systems or algorithmic decision-making or predictive policing. The uncertainty surrounding data collection, processing, consent, and accountability were highlighted by participants, especially legal experts (RLE1 and RLE2), due to this legislative gap. Moreover, the lack of clarity on issues of algorithmic bias, due process protections and accountability for decisions made by AI systems was cited multiple times as a key legal deficiency.

Ethically, the findings highlight significant privacy concerns, informed consent issues, over-ambitious surveillance and algorithmic discrimination. Experts in both legal and technological fields pointed out that AI systems that are built on biased or incomplete data can perpetuate social inequalities and result in biased targeting of certain groups. The use of continuous surveillance technologies, like facial recognition and predictive tracking, are also exacerbating ethical issues as they use public data without consent. The study also revealed that “black box” decision-making processes compromise transparency and accountabilities, making it hard to explain or challenge the results of AI-driven decisions in criminal justice.

5.2 FINDINGS FOR RESEARCH QUESTION 2: PERCEPTIONS OF STAKEHOLDERS ON AI-BASED PREDICTIVE POLICING AND INDIVIDUAL RIGHTS

The results reveal a different interpretation of predictive policing among the legal community, law enforcement and technological experts, depending on their respective professions, but all of them agree that the potential for AI-based predictive policing is transformative. Legal professionals (RLE1 and RLE2) are hopeful that AI can improve the ways in which crime can be prevented, but they are deeply concerned about potential infringements on constitutional rights, notably the right to privacy and dignity, enshrined in Article 14 of the Constitution of Pakistan. They are concerned about the lack of protection regarding personal data and underline the importance of introducing more robust accountabilities and transparency mechanisms in the algorithmic decision-making process, particularly with regard to transparency and accountability.

AI is perceived by law enforcement officials, whether RLEO1 or RLEO2, as a valuable tool that boosts efficiency, pinpoints crime hot spots and speeds up investigations. They showcase case studies of how facial recognition systems and forensic tools with AI have been successfully applied in high-profile cases. Technological experts (RTE1 and RTE2), on the other hand, offer a more technical perspective, recognizing the strengths and weaknesses of AI systems, such as data quality, algorithmic bias and lack of explainability. There is a shared worry regarding the potential for misuse of personal information, inadequate oversight of data use, and the lack of transparency and clarity in existing frameworks for fairness, transparency and safeguarding of individual rights within the context of all stakeholder groups.

5.3 FINDINGS FOR RESEARCH QUESTION 3: LEGAL, TECHNICAL, AND INSTITUTIONAL SAFEGUARDS FOR ETHICAL AI USE IN PAKISTAN

The study finds that a strong legal framework is the most pressing protection Pakistan needs for the ethical use of AI predictive models. The participants strongly call for comprehensive data protection laws like the proposed Personal Data Protection Bill 2023, and their amendment of existing laws, such as the Prevention of Electronic Crimes Act 2016. These must be clear legal instruments that outline who owns the data, the consent conditions, acceptable uses of the data and who is accountable for any misuse. Furthermore, it was emphasised that the individuals impacted by algorithmic decisions should have access to judicial oversight and appeal mechanisms, which are crucial for the protection of their constitutional rights and for due process.

Technically and institutionally, the findings highlight several key areas for improvement, such as: Transparency – transparency in AI systems is essential, along with frequent audits of algorithms and the embedding of bias detection processes. To minimize the potential risk of breaches and misuse, experts suggest adopting robust data encryption, anonymization measures, and decentralized data storage solutions. Institutionally, it is believed that an independent body or commission to manage AI-specific governance is vital. In addition, institutional safeguards are recognized as the collaborative efforts of legal and legalization professionals, law enforcement, and technological practitioners. Additional recommendations include measures for accountability, such as training programs; interdisciplinary teams; and public consultation mechanisms to ensure that artificial intelligence deployment is aligned with ethical and human rights standards and built on public trust.

6. CONCLUSION

The findings of the study show that despite the great potential of predictive models, based on artificial intelligence in crime prevention and to make the working of law enforcement more efficient in Pakistan there are still serious gaps regarding law, ethics, and institutions. The existing legal framework, primarily under the Prevention of Electronic Crimes Act 2016 and associated policies, is inadequate in dealing with the complexities of AI, including those with respect to algorithmic decision-making, data privacy, consent and accountability. The views of stakeholders indicate that there is a realisation of the benefits of AI in improving policing but there are also emerging concerns about over-use of surveillance, bias in the use of AI tools and insufficient transparency around the decisions made by AI.

The study ultimately finds that the use of AI in the criminal justice system may pose a threat to constitutional rights and public trust if there is no comprehensive regulatory framework and effective data protection laws, including the proposed Personal Data Protection Bill 2023. Thus, a combination of technological innovation and robust legal protection, ethical controls, and institutional responsiveness is necessary. To guarantee AI-driven systems are transparent, fair, and respect fundamental human rights, collaboration among legal experts, law enforcement, and technological professionals is crucial.

7. RECOMMENDATIONS

1. Introduce a comprehensive legislation specifically for AI-based predictive policing regulating its development, deployment, and monitoring in Pakistan.
2. Implement and improve the PDP Bill 2023 to establish precise guidelines on data collection, processing, consent and data storage.

3. Make specific mention of AI-driven surveillance, predictive analytics and algorithmic accountability in the Prevention of Electronic Crimes Act 2016.
4. Set up an independent national AI regulation body that ensures ethical principles, transparency, and fairness are adhered to in the use of AI in law enforcement.
5. Implement required audits of algorithms to identify bias, errors and discrimination in predictive policing models.
6. Promote transparency in AI decision making by providing easy-to-understand AI systems.
7. Implement robust data protection measures, such as data encryption, anonymization, and secure storage systems, to safeguard sensitive data against misuse.
8. Conduct intensive training programmes for law enforcement professionals in the ethical usage of AI, data management and the constraints of predictive systems.
9. Encourage the interdisciplinary exchange of ideas among legal professionals, technologists, criminologists, and law enforcement to achieve fair and just implementation of AI.
10. Develop public consultation and awareness mechanisms to foster trust, accountability and civil society engagement to develop AI governance policies.

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