

THE ROLE OF ARTIFICIAL INTELLIGENCE IN CRIMINAL INVESTIGATIONS IN INDIA

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Abstract: With an increasing presence, Artificial Intelligence in Criminal Investigations all over the globe is progressively emerging as a new tool. Applications of Artificial Intelligence in India have been rapidly proliferating, especially as criminal activities increasingly move into the online sector. The volume of evidence collected is experiencing exponential growth and traditional methods often lack the power and complexity required to address modern crime effectively. India's law enforcement agencies are seeking to embrace these through AI technologies and enhance their powers in solving crimes more effectively and efficiently. All these technologies like; predictive policing, facial recognition, natural language processing, or data analytics represent a pathway to faster speeds, higher accuracies, and better outcomes in Criminal Investigations. Predictive policing algorithms can be used to predict crime hotspots, while facial recognition systems can help identify suspects in a matter of minutes rather than hours and days taken in the manual methods. Moreover, AI can help in curbing cybercrime, which is the most challenging for law enforcement agencies in India at present. However, this use of AI in Criminal Investigation also raises concerns, particularly in the space of privacy and surveillance, protection of data and algorithmic bias. More specifically, the country's regulatory framework for the use of AI by law enforcement agencies is extremely weak and underdeveloped, which opens the door to abuse and the infringement of certain fundamental rights. This paper examines the advantages as well as disadvantages of Artificial Intelligence in relation to Criminal Investigations in India and lays out a lengthy list of issues that must be resolved before AI can be applied to the nation's criminal matters.

Keywords: Crime; evidence; ethical; framework; justice; predictive policy.

1. Introduction

Artificial Intelligence (AI), one of the most innovative technologies of the 21st century, revolutionizing a variety of industries, including law enforcement,

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healthcare, and finance. AI is becoming more and more important in Criminal Investigations in India, assisting law enforcement in addressing a variety of crimes more effectively and accurately (Spiridonov, 2023). The use of AI in criminal justice systems continues to be a progressive way forward with growing applications. Sophisticated uses have the potential to bring much-awaited solutions to police and prevent crime more efficiently. Deployment in Criminal Investigations means AI helps increase the processing capacity to detect large quantities of data patterns, allowing them to make relatively more accurate judgments that speed up the overall effectiveness of their investigations (Agarwal & Tiwari, 2020). India is a country with more than 1.4 billion people, and it has several challenges concerning law enforcement. The different rates of urbanization, rapid digitization, and increased internet usage have resulted in multiple crimes such as cybercrime, human trafficking, and organized crime, with terrorism and others on the rise. Alongside the traditional crimes, new ones have also surfaced, such as identity theft, online fraud, and digital harassment. New methods of detection and prevention are required for new kinds of crimes (Bhushan & Joshi, 2019). To combat these new threats, Indian law enforcement agencies are using AI technologies like machine learning, predictive policing, facial recognition, and natural language processing (NLP) more and more. Machine learning, one of the subcategories under AI, helps law enforcement agencies process large chunks of data that would otherwise remain undetected by human analysts. This is a technology used to identify hidden patterns in large data sets; it has worked well in giving insights into the trends of crime and even allowing the prediction of potential hotspots and identification of suspects through facial recognition software (Bhat & Kaur, 2020).

NLP also gives law enforcement an opportunity to read text-based data, such as social media posts, emails, and intercepted communications, for evidence of criminal intent. Predictive policing is more recent, leveraging AI to predict where crimes are likely to occur by using historical crime data, social factors, and other variables, so police forces can better allocate their resources and prevent crimes before they happen (Ali, 2021). The introduction of AI-based systems into Criminal Investigations offers several potential benefits for India's law enforcement system. Through the early identification of risks and the appropriate allocation of resources, these systems facilitate more effective crime prevention (Chandra & Mehra, 2021). Law enforcement agencies can drastically cut down on investigation time by using AI's rapid analysis of large datasets, which will increase the accuracy of case resolutions. For instance, facial recognition systems that use AI can be used to identify suspects in crowds or on surveillance footage, which would be a nearly impossible task for human officers to do in a timely manner (Deshmukh & Soni, 2020). In addition, AI tools help in resource optimization so that police departments

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are deployed to areas where they are most needed, based on predictive models that predict potential crimes. Despite these advantages, the application of AI in criminal justice brings about a great problem, especially with respect to privacy and ethical issues (Ajmera & Sharma, 2021).

Probably the most important fear is that AI will violate people's right to privacy. There are technologies, such as facial recognition and mass surveillance, that have brought questions about the delicate balance between public security and personal freedom. The high-level implementation of AI in surveillance can cause a large-scale, government-maintained biometric database with serious issues with unauthorized access and misuse of that sensitive information. This can further result in the reinforcement of existing biases within law enforcement and the over-targeting of certain communities (Khandelwal & Singh, 2020). In addition, AI in Criminal Investigations in India is further faced with the challenges of the lack of a robust legal framework. The country lacks proper national policy legislation on the employment of AI technology in law enforcement, which puts gaps in their regulation and oversight. This results in the chance of AI not being checked through proper regulation at times, possibly leading to malicious use or results (Naik, Jain & Sehgal, 2020). In addition to the growth of AI being an integral part of Criminal Investigations, clear policies, legal protections, and mechanisms for accountability need to be ensured as these technologies should be used in an ethical and constitutional rights-sensitive manner. It is with this objective that the paper explores the evolving role of AI in Criminal Investigations in India, both its potential benefits and the challenges it raises (Kumar & Sharma, 2019).

This paper explores the various uses of AI in criminal justice, its advantages, the related ethical conundrums, and the necessity of a robust regulatory framework to control its use by looking at the state of AI in law enforcement today. Further, it suggests a future course of action in the responsible and ethical integration of AI in India's criminal justice, so these advancements work in the interest of justice while respecting fundamental rights.

Research Methodology

The present study uses secondary sources, in the form of reports from the government, case judgments, journal articles, textbooks, news articles and industry reports in which AI has been used by law enforcement agencies. The study analyses all these materials to understand the scope, effectiveness, and challenges of the use of AI in criminal investigations. The research uses the technique of content analysis to identify key themes and trends in the use of AI by focusing on how various technologies are implemented in practice. Ethical considerations, such as the potential for bias in AI systems and privacy concerns, are also explored through the analysis of relevant case law and literature.

2. Applications of AI in Criminal Investigations in India

2.1. Predictive Policing

The approach uses predictive policing, an AI-driven approach that consists of complex algorithms in analyzing historical crime data to help predict where and when crimes are likely to take place (Tripathi & Agarwal, 2021). These proactive measures for crime prevention are increasingly being employed by crime-prone Indian cities like Delhi, Mumbai, and Bangalore to optimize the deployment of police resources with AI-based predictive tools (Bhargava & Sharma, 2021). These tools will aid in the predictions of crime hotspots so that areas with a higher potential for crimes like theft, assault, and terrorism can be pinpointed to police departments so they may increase patrols or resources there. AI algorithms will analyze the given data points, which include historical crime incidents, geographic information, time of day, and socio-economic factors to find the pattern and predict future criminal behavior. All of these insights help law enforcement to act proactively, thus crime rates and responses are reduced to a great extent (Pandey & Reddy, 2020). For example, a predictive policing system can indicate how many areas will have a particular type of specific crime, be it drug trafficking or violent crimes, where intervention by the police can be undertaken much earlier. However, it has been reported that predictive policing in India also raises issues concerning algorithmic bias. Many predictive policing tools rely on historical crime data that may reflect long-standing biases in policing practices. For instance, areas that have been historically over-policed or have been subject to discriminatory law enforcement may have higher predictions of future crimes, further targeting marginalized communities. These prejudices have the potential to unintentionally maintain disparities and undermine the effectiveness of law enforcement efforts. Thus, even though predictive policing has advantages, it also needs to be applied ethically and closely monitored.

2.2. Facial Recognition Technology

In Criminal Investigations around the world, facial recognition technology has become an indispensable tool, and its use in India is expanding quickly. As surveillance cameras proliferate and biometric data becomes more crucial, AI-powered facial recognition is turning into a vital tool for Indian law enforcement (Raghavan & Sharma, 2021). The Indian government has initiated programs such as the National Automated Facial Recognition System (AFRS), which is aimed at identifying and tracking criminals in various public spaces, thereby increasing security and assisting in Criminal Investigations (Government of India, 2020). Facial recognition technology comes in extremely handy when solving cases related to terrorism, missing persons, or wanted criminals (Reddy & Bansal, 2021). The giant biometric database of India, including the Aadhaar record, is their treasure trove,

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where law enforcement can cross-reference faces shot in public spaces against those available in databases. This capability accelerates the process of identifying suspects and solving crimes much faster.

Despite all these possibilities with facial recognition, it raises grave concerns, most of which fall under privacy and surveillance. The ability to use facial recognition for mass surveillance can, in fact, track citizens unknowingly and unbeknownst to them, raising ethical dilemmas about the freedoms of individuals and the unchecked potential for misuse or violation of such rights (Marda, 2018). Careful regulation and oversight will ensure that facial recognition technology is deployed responsibly and ethically within law enforcement.

2.3. Cybercrime and Digital Forensics

Cybercrime is another rising issue in India. This is due to an expanding digital economy, increased utilization of smartphones, and the internet. All these advancements have provided criminal users with opportunities for hacking, online fraud, and identity theft with incidences of data breaches (Zubair & Ahmad, 2021). To combat these constantly emerging threats, AI-powered tools in digital forensics have gained popularity among law enforcement agencies. AI-enabled technologies help investigators recover deleted files, decrypt encrypted data, and trace the online activities of suspects, thereby making cybercrime investigations much more effective and accurate (Raghavan & Sharma, 2021). AI-based algorithms are important for identifying fraudulent behavior in online transactions, detecting anomalous patterns in real time, and predicting potential cyber threats before they manifest. For instance, machine learning models can be used to analyze transaction data to flag irregularities in transactions to prevent financial fraud or identify cybercriminals before they can cause significant damage. Moreover, AI helps in tracking criminals engaged in online scams, like phishing attacks or credit card fraud, by collating data from multiple digital platforms (Taylor, Gulson & McDuie-Ra, 2023).

In cases like hacking or ransomware attacks, it can quickly provide the identification of the perpetrator involved and insights into the methods. AI tools for processing large datasets and hidden patterns may help investigators have a better insight into complex operations of cybercrimes, whereby law enforcement action can be rapidly taken to respond to the said incidents (Andrić & Ivanović, 2023). However, the increasing reliance on AI in digital forensics also requires ensuring data privacy and protecting individuals' rights within the digital landscape.

2.4. Natural Language Processing (NLP) and Sentiment Analysis

AI-based Natural Language Processing in India has significantly been applied for the analysis of large amounts of textual data such as emails, posts on social media, and even text messages. These data sources are usually abundant with useful information that will help the enforcement agencies to know about possible threats,

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criminal actions, or terrorism. NLP tools help investigators process and analyze large volumes of unstructured text to derive key insights, classify documents, and identify trends or patterns in language that may point toward criminal intent (Khandelwal & Singh, 2020). Among the key capabilities of NLP is the sentiment analysis technique that helps investigators assess the emotional tone of written text. This can be very useful in determining threats or psychological states of people, which are very important to understanding motives and behaviors in Criminal Investigations. Sentiment analysis can help determine underlying aggression, anxiety, or other emotions that might signal potential criminal activities (Gupta & Khandelwal, 2021). This technology finds particular relevance when the case includes cyberbullying, hate speech, or even online terrorism - where language could be used as a tool for inciting violence, promoting extremism, or hounding others. With the utilization of NLP tools, it is possible to detect and then respond to such crime better, before it escalates. As NLP continues to evolve, its role in Criminal Investigations is expected to expand, offering new ways to analyze digital communication for clues that can lead to the prevention or resolution of crimes.

2.5. Surveillance and Social Media Monitoring

Social media is very useful for law enforcement agencies seeking information related to Criminal Investigations; AI is becoming increasingly used for monitoring and processing data from various social media outlets. In India, AI social media monitoring tool allows the Law Enforcement Agencies of the country to analyze vast chunks of content on real-time scenarios to identify and trace potential terror threats, or public disturbances/organized crime in the country (Wadhwa & Khanna, 2019). AI algorithms can monitor hate speech, extremist propaganda, and other illegal content, which can prevent the spread of violence or criminal activities. In addition, AI-based surveillance systems allow investigators to monitor people and monitor their online communications in real-time, which means providing real-time intelligence for active investigations (Freeman, 2021). It may be helpful to identify individuals who are engaged in illegal activities or coordinate criminal activities online (Dadhich, 2018). The real danger, however, lies in the usage of such surveillance tools against not only privacy but also the eventual abuse of surveillance power. India, being a very diverse and democratic nation, dreads that unchecked surveillance would infringe upon the civil liberties of its citizenry, which requires very stringent regulations to balance the powers of security against individual rights.

3. Benefits of AI in Criminal Investigations in India

3.1. Enhanced Crime Detection and Prevention

Artificial Intelligence (AI) is reshaping Criminal Investigation and law enforcement policies, assisting agencies in making crime detection easier and preventing its

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commission. Various AI technologies predictive policing, facial recognition, and data mining are augmenting law enforcement capabilities with the shift in emphasis from reactionary to proactive control of crime, thereby allowing early identification of emerging patterns and taking pre-crime prevention measures (Pande & Agrawal, 2021). For example, in predictive policing, the data for historical crimes helps in forecasting when and where such crimes will be committed. Therefore, the police can focus more on those regions with high-risk possibilities. Response times are considerably reduced and also prevent crimes before they escalate further. AI systems are also highly important in crime trend detection for the law enforcing authorities to act in time, make better decisions, and formulate the right strategies in crime prevention.

It is most useful in high-risk areas, especially the major metropolitan cities of India, where the rate of crime and diversity is always on a high scale. Using AI tools, police forces can strategically be placed in places that are likely to experience the highest crime rates, such as theft, assault, or cybercrime zones (Vempati, 2022). These help reduce the waste of time while still on crime prevention by suggesting probable hotspots and criminal activity patterns beforehand to the authorities for possible intervention measures, thus curtailing the implementation of reactive techniques, which takes time. For that reason, AI helps control modern-day rising crimes and enhances the public security system in response to the situation in the fast-paced world (Srivastava & Joshi, 2021).

3.2. Efficiency and Speed

Perhaps one of the biggest benefits of AI in Criminal Investigations is its capability to process huge volumes of data with speed and accuracy. A huge volume of data, which might include video recordings from surveillance, digital communications, and financial transactions, might be too massive for investigators in law enforcement agencies (Baig, Khan, Mohammad & ben Brahim, 2022). The use of AI-powered tools allows the examination of hours of video footage, thousands of social media posts, and large sets of transaction records in a matter of time that would take a human investigator days to complete. This efficiency quickens the investigation process, thus enabling law enforcement to draw conclusions much faster and solve cases quicker.

This makes AI tools valuable in Criminal Investigations in India because the country's large population generates huge amounts of data every day due to digitization. Facial recognition technology, for instance, can go through hours of footage and pick up on suspects in just seconds, something that human officers would not have a chance to do manually (Mehta & Ghosh, 2020). Just as AI can track tens of thousands of social media postings to alert it to any sign of possible crimes, for instance, hate speech that's coordinated or planned attacks by terrorists, allowing an investigation to spring into action even sooner. Because law

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enforcement can take more time to focus on a case the quicker data processing can extract necessary information, hence boosting the whole process of justice delivery. Another reason why AI contributes to more effective decision-making is that it can process large datasets much faster. In fast-paced investigations, the in-between gap between the gathering of evidence and response to the threats of crimes assumes particular importance. The more the reduced time gap with the help of AI, the more it strengthens the elbow room of agencies in policing for real-time decisions based on accurate data for quicker and more precise actions in the field (Zaytsev, Pastukhov, Fadeeva & Perekrestov, 2021). This efficiency finally brings about improved outcomes of Criminal Investigations and, thus, contributes to better public safety.

3.3. Improved Resource Allocation

AI is widely used for the optimization of the deployment of police resources, meaning that law enforcement agencies can align their people and resources with what is most needed. In cities like Delhi, Mumbai, and Bangalore, where crime rates are high and resources are scant, AI tools can optimize more effective allocation. AI-based systems can look into crime statistics, demographic statistics, and trends to identify places with the maximum level of requirement for law enforcement interventions. An AI-based predictive model can mark a place if criminal activities are on a rising trend within it or are most likely to increase in the future. This can focus police department resources on such areas, hence increasing patrols in hotspots or allocating investigative resources better. The AI tools can also improve the optimum amount of staff, depending on real-time data, number the of officers present to work (Silva et al, 2021). This ensures that in low-crime areas, law enforcement agencies are not saturated and sufficiently covered in the high-crime zones.

Improved resource allocation serves to enhance law enforcement efforts' effectiveness and to decrease unnecessary expenditure, which in recent times is increasingly important for police departments faced with limited budgets. This will help the agencies make better use of AI to enhance planning as well as deployment of resources and eventually achieve more with fewer people to enhance public safety and the impact of every officer's effort.

3.4. Combating Cybercrime

AI is becoming a very important tool in the fight against cybercrime, which has become a growing threat in India and worldwide. As the country becomes increasingly reliant on digital platforms for communication, commerce, and banking, cybercrime is taking the shape of one of the biggest challenges for law enforcement (Rao, R., and Sethi, N. 2019). Cybercrimes include financial fraud, identity theft, data breaches, and online child exploitation. All these have increased alarmingly and are normally dealt with by inappropriate traditional methods. AI allows for advanced

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capabilities to track suspects, expose illicit activities, and protect victims from digital harm by law enforcement agencies. Improved resource allocation serves to make law enforcement efforts more effective as well as decrease unnecessary expenditure, which in recent times is an increasingly important objective for police departments under budget constraints (Quezada-Tavárez, Vogiatzoglou & Royer, 2021).

AI tools can analyze massive sources of data from digital platforms such as emails, social media, and transaction records in order to detect unusual or suspicious activities. For instance, machine learning algorithms can flag those fraudulent transactions in real-time by identifying patterns that go against typical behavior, preventing financial fraud before it happens (Kabol & Faghiri, 2022). AI can be used to track the entire activities of cybercriminals across multiple online platforms: their methods to exploit vulnerabilities or execute illegal schemes.

In cases of online child exploitation, AI algorithms can scan and analyze digital content to detect inappropriate material, thus making it easier to identify offenders and prevent further abuse. AI equips law enforcement agencies with the ability to analyze digital evidence at scale, thereby allowing them to combat cybercrime more effectively and efficiently and reduce the risks of online criminals, protecting the victims (Raghavan & Sharma, 2021). AI-based systems can also provide enhanced cyber security for critical infrastructure, helping prevent data breaches and secure sensitive information from cyber-attacks. Then, law enforcement agencies, integrated with AI-driven monitoring tools, can better protect individuals and organizations as well as government institutions from digital threats safer and more secure digital ecosystem (Zuev & Bakhteev, 2021).

4. Challenges and Ethical Concerns

4.1. Privacy Issues and Surveillance

When it comes to data collection and surveillance, the use of AI in Criminal Investigations in India is highly sensitive to privacy concerns. Law enforcement organizations can be equipped with tools that effectively detect and prevent crime thanks to AI's capacity to perform facial recognition, predictive policing, and social media monitoring (Mishra & Dubey, 2020). However, these capabilities might result in widespread surveillance, which would violate people's right to privacy. Widening these systems across a democratic country like India, where individual freedoms are basic, means that an ordinary citizen is liable to be encroached upon by massive surveillance systems involving AI. For example, facial recognition can operate in public spaces capturing images of individuals without their knowledge or consent, which can enable tracking of the movements of individuals in real time. While this may work in the process of detecting criminals or preventing crimes, it also questions the limits of state surveillance and citizens' right to privacy. Given all this, the gap in the comprehensive data protection law within India further adds to the disturbance.

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The uncertainty and therefore lack of clear regulations about how AI technologies should be used in criminal justice operations have created a legal vacuum within society to balance crime prevention with the protection of civil liberties. In the absence of such a framework, AI can be used punitively and excessively or violate privacy in several ways, giving room for unduly surveillance or even misuse (Yadav & Malik, 2020). There should be data protection law as well to protect data along with responsible use of AI in policing.

4.2. Bias and Discrimination

Another serious issue involving the use of AI in Criminal Investigations is probably bias and discrimination in the way algorithms make their decisions. Algorithms learn from the historical data present, and such data, where it holds a bias, creates an unintentionally carried-on issue by the system (Srivastava, 2018). Specifically, in the Indian context, and based on the historical biases evident in policing and constabulary practices, it is apparent that AI systems, such as predictive policing and facial recognition, could extend and strengthen those biases, hence targeting the most vulnerable groups in society: the poor, other minority groups, or ethnic communities (Sharma & Patel, 2020).

It is, therefore, very crucial for AI systems to be trained with diverse datasets that are representative enough to serve in the reduction of such risks. In this regard, it will guarantee that the algorithms are not biased towards any given group, thereby having an unjust implication on some subsets of the population (Zehra & Desai, 2019). Therefore, balancing the model will require periodic auditing and refinement to ensure fairness and equity in its applications. Thus, addressing potential bias in AI systems will make India work toward its criminal justice system remaining just and inclusive.

4.3. Lack of Regulation

The most significant problem that arises in Indian Criminal Investigations using AI is that there is no well-articulated legal and ethical framework that guides the use of AI. While discussions have been going on regarding data protection laws, India does not have a comprehensive set of regulations that specifically deal with the use of AI in law enforcement (Yadav & Malik, 2020). Such an absence leaves scope for ambiguity in the use of AI technologies in Criminal Investigations. The deployment of AI systems may leave room for violation of the rights of citizens, including mass surveillance, biased decision-making, or unwarranted data collection. In the absence of regulation, AI tools may be used indiscriminately with little oversight or accountability. This can result in quite severe harm, such as violations of privacy, discrimination, and the erosion of trust that citizens need to have with law enforcement agencies (Zakaria & Soni, 2020). This is an extremely important reason why the Indian government should establish clear and robust policies and regulations

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that guide the appropriate use of AI in criminal justice. The guidelines should include stipulations on the privacy of data, transparency about algorithms, human oversight, and mechanisms for holding people accountable so that these AI technologies can be used fairly, transparently, and consistent with human rights standards.

4.4. Transparency and Accountability

Lack of transparency and accountability in the AI decision-making process is another serious concern for the use of AI in Criminal Investigations. Many of the predictive policing or judicial decision-making AI systems are regarded as "black boxes". It refers to a condition where AI system decision-making is not intelligible or cannot be explained by humans, thereby challenging the possibility of holding them accountable for their decisions (Rao & Sethi, 2019). In Criminal Investigations, high stakes are at play because the lives and freedoms of numerous people are uncertain. For AI systems to be used here, they have to be transparent and explainable in terms of how and why they make decisions. Taking, for example, the case where an AI predicts a particular area as being a crime hotspot or recommends a certain suspect, law enforcement officers and even the public should know the reason behind such decisions. This would include transparency in the AI systems themselves, so there is human oversight and responsible application of these technologies. Mechanisms for accountability in the use of AI tools so that they don't end up being misapplied or unfair should also be established.

Regular audits of AI algorithms, clear documentation of decision-making processes, and the involvement of human experts in decision-making are essential to maintaining accountability. Ensuring that AI systems are explainable and their decisions are subject to oversight will ensure that these technologies are used in a fair and just manner, thereby instilling trust in the criminal justice system (Raghavan & Krishnan, 2021).

5. Conclusions

Artificial Intelligence has the potential to significantly enhance Criminal Investigations in India, with efficiency, crime detection, and prevention all improved by a great deal. Predictive policing, facial recognition, digital forensics, and social media monitoring can all be tools that would be equipped for law enforcement agencies to tackle traditional crimes as well as emerging threats such as cybercrime and terrorism. These are the technologies that could facilitate proactive and data-driven approaches, capable of making authorities far better at both crime prevention and suspecting the accused. All the same, deploying AI in criminal justice carries a lot with it, much of which raises important issues such as privacy, bias, and transparency. Left unchecked, such technologies may also violate individuals' rights to privacy, contribute to biases in decisions, and break down public confidence in the criminal justice system. The government and law enforcement will, therefore

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have to create and establish clear regulatory frameworks governing the ethical use of AI. Such regulatory frameworks should focus on transparency, data protection, and accountability in their use of responsible and fair AI systems.

As India continues to integrate AI into its law enforcement strategies, it needs to invest in the training of its law enforcement personnel, effective oversight mechanisms, and public awareness regarding the potential benefits and risks that come with AI. In this manner, India will be able to utilize the transformational capabilities of AI to make its criminal justice system more equitable and safe for its citizens while safeguarding the rights and liberties of its citizens.

Abbreviations

AI-Artificial Intelligence

NLP-Natural Language Processing

NCRB-National Crime Records Bureau.

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