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## ROLE OF ARTIFICIAL INTELLIGENCE IN SMART POLICING SYSTEM IN INDIA: AN OVERVIEW

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**Abstract:** Artificial Intelligence (AI) is increasingly being used in policing in India to improve crime detection, surveillance, investigation, and emergency response. Technologies such as Facial Recognition Technology (FRT), the Crime and Criminal Tracking Network & Systems (CCTNS), predictive policing, intelligent video surveillance, and Natural Language Processing (NLP) are supporting the development of smart policing. However, the use of AI also creates challenges related to accuracy, privacy, bias, transparency, accountability, and constitutional rights. This study examines the role of AI in smart policing in India through a review of existing literature, government initiatives, legal developments, and selected case studies. The study finds that AI can improve police efficiency and crime management, but its effective use is limited by technological, infrastructural, legal, ethical, and skill-related challenges. The study suggests that AI-based policing should be supported by appropriate legal safeguards, human oversight, data protection, accountability, and institutional capacity building. It concludes that the effective use of AI in policing requires a balance between technological development, public security, and the protection of individual rights.

**Keywords:** Artificial Intelligence (AI); Smart Policing; Predictive Policing; Facial Recognition Technology; Crime Analytics; Police Technology; Privacy; Data Protection; India.

### INTRODUCTION

The Indian law enforcement system works on a massive scale as it is responsible for providing security to over 1.4 billion Indians living in 28 states and 8 union territories. Such extensive reach and demography create continuous stress for the Indian police system. As per BPR&D, the present ratio of police to citizens in India is 150 to 181 per 100,000 persons. This ratio is significantly far away from the recommended ratio of 222 as suggested by the United Nations. It means that there is a deficiency in the police manpower in India. To fill this gap in terms of manpower will require more money and more time. In this case, technology should come to the rescue. The application of Artificial Intelligence in such situations provides the innovative approach towards overcoming traditional problems of moving from reactive policing to proactive policing. The concept of Artificial Intelligence could be described as the use of computer algorithms for performing tasks which generally require human intelligence like visual recognition, speech recognition, pattern recognition, and decision-making. The use of sub-branches such as Machine Learning (ML), Natural

Language Processing (NLP) and Computer Vision can enable AI systems to analyze huge volumes of data much faster than human minds. In the context of policing, AI includes a wide range of technology applications such as facial recognition systems, automated surveillance systems, crime analytics and intelligent traffic management systems.

**Research Objectives:** The objective of the research is to

- Study the existing AI implementations in Indian policing
- Analyze the efficiency using case studies
- Find out the benefits, challenges and ethical issues associated with AI
- Offer recommendations for balanced implementation of AI

## SIGNIFICANCE OF THE RESEARCH

The significance of the research is that India is one of the largest AI policing deployments of the world in a democratic country. Therefore, this research will help in understanding how security and privacy rights can be balanced through the use of technology.

## METHODOLOGY

The research methodology is going to use both qualitative and quantitative approaches by reviewing literature, analyzing case studies, government reports, laws and legal cases and implementation details from various states.

## LITERATURE REVIEW

**Global Perspectives:** Studies from international literature on AI in law enforcement offer valuable insights. For instance, Ferguson (2017) in "The Rise of Big Data Policing" discusses the potential impact of predictive algorithms on American law enforcement agencies. Brayne (2017) discovered that digital surveillance technology can lead to the formation of "systems of suspicion" in relations between police and community in Los Angeles. International uses of AI are varied as well:

- United States: PredPol and CompStat systems for predictive policing (Perry et al., 2013)
- United Kingdom: Facial recognition trials conducted by Metropolitan Police with various outcomes (Fussey & Murray, 2019)
- China: advanced AI surveillance systems, including social credit systems (Liang et al., 2018)

**Indian Context:** Studies related to India have not been many but are on the rise. Mukherjee and Sharma (2021) conducted research on CCTNS and found positive impacts on the exchange of information, despite some technological issues. Arora (2020) did a study on the implementation of facial recognition technology in Delhi and highlighted the issues regarding accuracy and privacy. As per NCRB (2021), there has been a drop in crimes in the smart policing areas.

## THEORETICAL FRAMEWORK

In order to conduct an extensive study of AI policing, it is essential to use the theories of surveillance (Lyon, 2007), algorithmic justice (O'Neil, 2016), and security-privacy trade-off (Solove, 2011).

## AI Technologies in Indian Policing

**Facial Recognition Technology (FRT):** uses biometric systems to recognize people through analyzing unique features found on their faces in pictures or videos. One of the biggest landmarks in the use of this technology in India was the launch in 2020 of the National Automated Facial Recognition System (AFRS), which cost ₹90 crores. This project is expected to develop a comprehensive framework that will allow the seamless connection between the databases of crimes at both state and national levels (NCRB, 2020). This technology can perform many vital tasks in contemporary police forces, ranging from identifying suspects through analysis of CCTV footage to helping in tracking missing people and enhancing the security and

control at borders. Among other applications is monitoring crowds at big events. The increasing use of FRT in India is evidenced by its implementation in cities like Delhi, Mumbai, Hyderabad, and Bangalore.

**Predictive Policing:** Through the use of statistical methods and machine learning, predictive policing entails predicting future criminal behaviour on the basis of existing trends. This technique functions mainly through three models, which include:

Prediction using:

- Location-based predictions to determine hotspots for criminal activities;
- Person-based predictions to create risk profiles; and
- Pattern based prediction to spot crime sequences. In India, states like Uttar Pradesh,

Punjab, and Telangana have already applied these predictive models for better management of resources and patrol deployment (Kumar, 2021).

**Crime Analytics and Video Surveillance:** AI-enabled video analytics software analyses the footage captured in real time and identifies any suspicious activities, abandoned objects, and crowd density. The Crime Mapping Analytics and Predictive System (CMAPS) analyses past crime data and helps identify patterns in order to optimize resource allocation.

**Natural Language Processing and Chatbots:** NLP technologies allow automated analysis of FIRs, multilingual complaints processing, and AI chatbots that can be used for citizen services. Tamil Nadu "Cyber Sahayak" chatbot provides citizens assistance for cybercrime reporting, while the National Cybercrime Reporting Portal utilizes NLP for classification of complaints in multiple Indian languages.

## MAJOR INITIATIVES AND IMPLEMENTATION

**National-Level Initiatives:** Started in 2009, the Crime and Criminal Tracking Network & Systems (CCTNS) connects more than 15,747 police stations all over India through advanced IT systems that are developed for digitalization and monitoring of the crimes, inter-state data exchange, statistics, citizen services, and crime pattern analysis using artificial intelligence technology. By 2022, it became possible to digitize more than 33 crores of criminal records in India thanks to this system (NCRB, 2022). Further digitalization of India leads to another attempt to establish an integrated facial recognition system based on the digitalization of criminal records, CCTV footage, and missing people databases. Despite the high potential of the system, it is criticized for possible infringement of privacy and persistent problems with accuracy (Internet Freedom Foundation, 2020). The Ministry of Home Affairs also started Safe Cities Project for improving the safety of Indian women in Delhi, Mumbai, Kolkata, Chennai, Bangalore, Hyderabad, Ahmedabad, and Lucknow. It was financed with ₹2,919 crores and was aimed at establishing AI-based CCTV networks, intelligent emergency response, and predictive analytics (MHA, 2021).

## STATE-LEVEL INITIATIVES

**Uttar Pradesh:** Technological innovations in Uttar Pradesh have led to impressive achievements, which have resulted in a 23% decrease in the crime rate within the 2019-2020 timeframe (UP Police, 2020). These achievements include such projects as the introduction of the AI powered Dial 112 Emergency Response system that reduced the time of emergency response from 40 minutes to 10 minutes. Besides, CMAPS (Crime Mapping Analytics and Predictive System) is used to investigate crime patterns in all 75 districts. The significance of the above innovations could be observed during the 2019 Kumbh Mela when the introduction of facial recognition technologies helped to find 853 lost children and to reunite them with their parents.

**Telangana:** became a forerunner in applying AI-based policing due to the implementation of integrated surveillance and analytics. In particular, the Hawk-Eye project in the state helped to create a wide grid of surveillance based on 6 lakh CCTV cameras in Hyderabad, which works under the guidance of the TSCOP command and control center that includes AI analytics. Also, the deployment of facial recognition technology in Telangana was successful, which helped to track over 3,000 missing persons (Telangana Police, 2021). Moreover, Telangana Police innovatively integrated automated technologies with mobile applications to report crimes.

**Delhi:** There were many initiatives to modernize law enforcement in Delhi police, in particular, integrated command centers and active facial recognition systems were used to improve the overall safety. To protect public safety, and especially the safety of women, Delhi Police provides Himmat mobile application in coordination with a wide surveillance system that includes 2.8 lakh CCTV cameras (Delhi Police, 2021).

## CASE STUDIES

### Case Study 1: Kumbh Mela 2019 – AI for Mass Gathering Management

The Ardh Kumbh Mela held in Prayagraj between January and March 2019 drew over 150 million attendees, making it the world's largest human gathering and a profound logistical challenge. This situation required a huge technological setup of 1,000 HD cameras with Facial Recognition Technology (FRT), 50+ drones that use AI for crowd management, and advanced predictive analytics to estimate crowd movements. All of the above-mentioned tools were integrated into one Command Center, which used real-time dashboards to coordinate ground staff. From the results of such integration, one can conclude that there was no trouble with the implementation: the FRT was able to help to find 853 missing children and catch 67 criminals (UP Police, 2019). Also, the AI technology helped to prevent any kind of stampedes and decreased the time needed to deliver emergency assistance to eight minutes. However, the privacy concerns raised by NGOs were also justified by the situation.

### Case Study 2: Telangana Hawk-Eye Project

Having been implemented in 2020, Telangana's Hawk-Eye project presents a unique case of using AI surveillance that connects six lakh CCTV cameras to a Command Control Center via deep learning. In terms of achievements, it is worth saying that by 2022, the huge technological system managed to locate 3,247 missing persons (Telangana Police, 2021) and provide digital evidence for 12,500 cases of crimes. In addition, Hawk-Eye project has been successful in automation of 15 lakh cases of traffic violations; 18 percent reduction of street crime in areas where the system operates; and decreasing time of police response from 30 minutes to only 12 minutes. At the same time, while presenting impressive achievements, the project encountered numerous technical and ethical challenges. Specifically, those challenges included the high percentage of false positives (up to 15 to 20 percent), problems with bandwidth in transmitting video footage, special training for police officers, and privacy concerns.

### Case Study 3: National Cybercrime Reporting Portal

**Launched in August 2019 by Ministry of Home Affairs** in order to make the process of redressing grievances by the general public and incident reporting efficient, the platform uses high levels of artificial intelligence. These include the use of a multi-lingual chat bot in interactions with users as well as Natural Language Processing (NLP) that helps in the automatic classification of complaints. By 2022, these technological interventions had successfully processed 5.3 lakh filed complaints, which included reports of financial fraud amounting to a staggering ₹4,200 crore. Crucially, the AI-driven analytics successfully identified and linked 8,500 related complaints, significantly improving investigative efficiency and enabling an average automated complaint acknowledgment time of just 72 hours.

## Advantages of Ai in Indian Police Department

**Operational Efficiency:** The introduction of AI into the processes of law enforcement agencies has provided significant improvements in terms of productivity in a number of performance criteria. In the case

of cities that employ AI-integrated command centers, the time taken for responding to emergencies has been significantly reduced by 40-60%. Moreover, the employment of predictive analytics and optimal allocation of resources has helped minimize unnecessary patrols by 25-30% and has sped up the process of investigating crimes by 35% in pilot projects.

**Improved Crime Detection and Prevention:** The introduction of AI tools in states led to the average reduction of crime rate in the areas of coverage by 15-20% (NCRB, 2021). Video analysis can scan thousands of hours of video, while predictive algorithms allow proactive policing through identifying crime hotspots.

**Improved Missing Persons Recovery Rate:** There has been an enormous improvement in the rate at which missing persons are found in India due to the use of Facial Recognition Technology (FRT). There have been successful uses of the technology through high profile demonstrations. For example, FRT was used in the 2019 Kumbh Mela event for reuniting 853 missing children with their parents. FRT has played an important part in modernizing search and rescue efforts since 2020 when the Telangana police in India found 3,247 missing persons using it.

**Reduced Corruption and Increased Transparency:** Electronic systems generate audit trails reducing corruption risks. The reduction of traffic violation enforcement corruption is reported to be 45% in Mumbai because of AI use (Mumbai Police, 2021).

**Evidence-Based Decision Making:** Dashboards in real time provide information on resource allocation and training needs. NITI Aayog estimates the annual cost savings due to AI integration into Indian police department up to ₹15,000-20,000 crore (NITI Aayog, 2018).

## CHALLENGES AND LIMITATIONS

**Technical Challenges:** However, despite the vast potential of using AI in the police work of India, there are numerous obstacles connected with the use of algorithmic precision, infrastructure, and quality of data. One of the main problems is related to the accuracy of facial recognition technology. In particular, it was stated by the Delhi Police that the accuracy rate of the Facial Recognition Technology amounted to 2% in one case (Singh, 2020). Besides, many researchers report on existing algorithmic biases leading to higher error rates for women and darker-skinned people (Grother et al., 2019), with false-positive rates being 10 to 20% in initial deployments. The problem is especially relevant for India because of its demographic diversity, different image quality, and huge size of databases. Moreover, there are substantial infrastructure obstacles for wider implementation of AI in Indian law-enforcement, as 67% of police stations in India have computers (BPR&D, 2021). Further implementation of AI is complicated by the lack of proper internet connections in rural regions, limited storage space on servers for petabytes of surveillance video data, and problems of incorporating new technologies into old infrastructure. Finally, the data forming the basis for the functioning of AI algorithms may be questionable in terms of recording procedures, inaccuracy in historical crime record keeping, and multiple database breaches.

**Human Resources Challenges:** This transition towards AI in law enforcement suffers greatly due to a large gap in skill sets along with the resistance that many organizations exhibit. As mentioned by the Bureau of Police Research and Development (BPR&D, 2022), only 15% of police personnel have had basic training regarding their IT skills. The problem of having low literacy levels makes it difficult for employees to understand the intricacies and the constraints associated with using algorithms to make decisions. Another major issue lies in the form of technological resistance from many organizations. Even if special training has been provided to police personnel, it is hindered due to a large attrition rate.

**Legal and Regulatory Challenges:** The speedy adoption of AI in Indian law enforcement takes place in a major legal lacuna owing to the absence of any dedicated laws regulating the same. The Information Technology Act of 2000 is woefully inadequate when it comes to handling such complex technologies as FRT and predictive policing. Moreover, there has been no clarity on regulation since the 2022 draft Personal Data Protection Bill was withdrawn from consideration. Such a legal gap poses serious constitutional questions in view of the seminal verdict in Justice K.S. Puttaswamy v. Union of India (2017). According to

the said case, privacy is a fundamental right under the Constitution of India. Therefore, current use of AI violates the constitutional standards of being statute-based, necessary, and proportionate. The unregulated use of technology has led to judicial activism in the form of Public Interest Litigations (PILs). Several petitions have been filed in the courts at present regarding the issue. Some of the key examples of litigation include Delhi High Court's 2020 petition regarding violation of privacy with regard to NAFRS, issues surrounding the FRT system in the Delhi Metro with regard to consent and data storage, and serious problems arising due to use of FRT in CAA protests, where civil society groups allege a chilling effect on the fundamental right to peaceful assembly.

**Privacy and Ethical Concerns:** In any case, the use of AI in the police of India is associated with significant ethical, privacy, and financial problems. Algorithmic biases are still an important problem; according to the research by IIT Delhi (Sharma & Kumar, 2021), commercially available face recognition technology algorithms demonstrate the rate of errors for people from Scheduled Castes and Tribes by 15-20% higher than usual, thus using prejudiced historic data to maintain discrimination of the vulnerable groups. This problem is enhanced by privacy violations due to mass surveillance system consisting of more than 10 million CCTV cameras throughout the country. Absence of strict legislative restrictions regarding data collection and storage makes the system vulnerable to "function creep," when the infrastructure created for traffic control is used to observe political demonstrations, thus discouraging active participation in democracy (Centre for Internet & Society, 2021).

Also, lack of data protection mechanisms is another important problem. Citizens do not have an opportunity to request access to personal data, correct algorithms' mistakes or clarify data sharing regulations. This fact made the system vulnerable to security breaches, including the 2021 breach of CCTV data in the CCTNS. Moreover, these technologically advanced systems suffer from considerable financial and sustainability problems. Along with the huge capital investments in the implementation of such technologies – for example, AFRS cost ₹90 crores, Safe City initiative cost ₹2,919 crores, while individual states spend up to ₹500 crores each – annual maintenance requires 15-20% of initial costs. The sustainability of such systems seems to be very low; as shown in the 2021 CAG report, 40-50% of installed CCTV cameras in several tier-2 smart cities stopped functioning completely within three years after implementation.

### Legal and Ethical Issues

**Constitutional Considerations:** The integration of AI in law enforcement raises profound constitutional concerns, primarily colliding with the **Right to Privacy**, which the Supreme Court enshrined as a fundamental right under **Article 21** in the landmark *Justice K.S. Puttaswamy (Retd.) vs Union of India* (2017) judgment. According to this ruling, any state infringement on privacy must satisfy a strict three-fold test: **legality** (existence of a specific backing law), **legitimate aim** (serving a crucial state objective), and **proportionality** (using minimally restrictive means with adequate safeguards). The current use of artificial intelligence fails to meet such constitutional standards because of a lack of statutory authorization and adequate safeguards. In addition to the above, AI technologies pose a danger to other fundamental rights enshrined in the constitution. The bias of algorithms involved in many predictive models and face recognition software can pose a violation of the right to equality under Article 14. On the other hand, the chilling effect brought about by mass surveillance without safeguards poses a danger to the fundamental right to freedom of speech and peaceful assembly under Article 19.

**International Human Rights Obligations:** As a state-party under the ICCPR, India is bound by international law to protect basic human rights such as the right to privacy (Article 17), right to freedom of expression (Article 19), and right to freedom of peaceful assembly (Article 21). However, the rapid advancement of policing technology using AI is receiving international condemnation. The UN Special Rapporteurs have raised official objections about the trend of installing mass surveillance systems in India, which poses a threat to meeting these obligations of international human rights law.

**Need for Regulatory Framework:** Setting up a framework for the deployment of AI in police activities involves certain essential components, from legislative measures controlling the use of AI and imposing stringent accuracy requirements on all deployed algorithms to the establishment of an independent oversight

body for the approval and supervision of the systems. Moreover, law enforcement agencies have to be under legal obligation to provide transparency regarding the type of AI used and the way it operates. In order to protect civil liberties, such a system should also ensure that there are available channels for redress for individuals negatively impacted by the mistakes of algorithms.

## RECOMMENDATIONS

**Policy & Legal Reforms:** To solve the legal and ethical shortcomings of using AI in policing right away, there needs to be a multi-level legislative response. Firstly, India needs to pass a Comprehensive Data Protection Act, which would significantly limit the privacy exceptions for law enforcement purposes, create an overseeing body and fine offenders financially. Meanwhile, India should legislate the use of AI in policing through an AI-Specific Policing Act that would define when the use of such technologies would be permissible and when not. Such legislation should require the establishment of certain minimum standards for the use of algorithms in the criminal justice process such as 99% accuracy rate of AI algorithms in those contexts, along with ensuring the legal obligation of algorithmic transparency, auditing of technical nature and mandatory human oversight in decision-making processes. Lastly, the laws need to be enforced by the Statutory Independent Oversight Entity that would consist of technical experts, civil society representatives and retired judges.

**Technical Standards and Safeguards:** To ensure operational accountability and fairness, the deployment of AI in law enforcement must be bound by stringent mandatory technical and procedural obligations. Accuracy testing needs to be done regularly in various demographic groups to uncover the hidden biases within the system's algorithm. Moreover, there should be security measures in place which ensure encryption throughout the entire process and creation of records of all access requests. It has to be accompanied by the process of automating the deletion of data after the retention period ends. Lastly, for the sake of following due process, there has to be an element of explain ability where there is a need to have an explanation for any decision made by the AI algorithms.

**Capacity Building:** In order to maximize the benefit of AI within the police, much effort needs to be taken in terms of building capacity. This will come about through the training of all members in the police force and making them technology savvy. This will require a strategy where the police collaborate with the best institutions of technology such as IIT to create the right curriculum, as well as build the environment of learning which will be responsive to changes brought about by technological developments. This will finally bring about much greater cultural change within the organization.

**Community Engagement:** In order to generate public confidence and create a culture of democratic responsibility, the implementation of law enforcement technology has to be entrenched within the framework of participatory governance. First of all, it should start from the compulsory consultation of the public before implementing any new AI or surveillance technology. For ensuring continuous oversight by the citizens, it is also necessary to form monitoring committees of the community and stringent rules to make sure that complete transparency in the use of the surveillance system has to be made known. Moreover, there has to be provision of proper channels of redressal of grievances and public awareness campaigns for the same.

**Proportional Implementation Strategy Framework:** To ensure that the deployment of AI technology by the police does not violate the constitution, each application of AI will require a proportional analysis on a case-by-case basis. The assessment should be based on three fundamental principles, the first one being the Test of Necessity, which will question the necessity of the particular policing objective and whether the police aim can be achieved using conventional methods without the use of AI technology. The second test is that of effectiveness, which requires empirical proof that the technical intervention achieves the intended purpose. The third principle in the assessment is the Test of Proportionality, which ensures that a careful comparison is made between the societal benefits of the deployment and the potential harms associated with it and privacy issues as well, provided there are proper safeguards in place. In addition to the above

assessment, the overall regulation needs to take a risk-based regulation approach. Within the proposed approach, High-Risk deployments such as live face recognition at gatherings and predictive policing software will have the highest levels of scrutiny applied to them. The medium-risk deployments include post-event video forensics and automated traffic enforcement. Lastly, the low-risk AI includes public grievance chatbots and routine administration automation.

## CONCLUSION

**Findings:** The implementation of AI in Indian policing embodies an ironic contradiction in which the rapid implementation of technology not only increases efficiency but at the same time creates governance issues. Although these technologies provide many benefits like faster response times, improved investigation process, recovery of missing people, and efficient functioning, these technologies lead to very serious negative outcomes such as a breach of privacy, equality, and freedom in democracy. It highlights three major systemic gaps in the form of a legislative gap that refers to the absence of legislation regarding the implementation of AI in law enforcement that breaches the fundamental rights of citizens to privacy; a technological gap due to algorithmic mistakes and inadequate infrastructure facilities; and lastly, an accountability gap due to the lack of transparency in operations and non-existence of any redressal mechanism for the citizens.

**Balancing Security and Rights:** The important thing is the proper balance of security interests and the protection of human rights. At present, however, there is an imbalance tilted toward security without adequate checks and balances. This involves: Rights-Based Approach: The beginning point being the constitutional rights and the use of AI as an instrument in the context of rights-based policing. AI Use on an Evidence Basis: AI use on account of its proven effectiveness and appropriateness, rather than technology alone. Responsibility: Consistent responsibility through oversight, auditing, and evaluation of harms.

**Significance and Contribution:** The importance of the study and its primary contribution to the field can be understood from its multifaceted approach towards research. First, it offers an all-inclusive depiction of the scenario of AI-enabled policing in India, based on empirical studies backed by practical examples. In addition to that, the study analyzes these technologies based on a rights-oriented approach, which results in policy suggestions based on evidence.

**Final Observations:** India may get a chance to show the world how AI can serve for policing in a democratic setting. This would imply transition from technocratic approaches to socio-technological systems that would include values and diversity and would respect human dignity. A lot is at stake at this particular moment, as the decisions made right now will define state-citizen relationships for many decades ahead. AI can help improve and streamline policing in general and would never turn into a tool of oppression if used responsibly.

The future belongs to the responsible today.

## REFERENCES

### Books and Articles

- Arora, M. (2020). "Facial Recognition Technology in India: Privacy Concerns and Regulatory Gaps." *Indian Journal of Law and Technology*, 16(2), 145-178.
- Brayne, S. (2017). "Big Data Surveillance: The Case of Policing." *American Sociological Review*, 82(5), 977-1008.
- Ferguson, A. G. (2017). *The Rise of Big Data Policing: Surveillance, Race, and the Future of Law Enforcement*. New York: NYU Press.
- Fussey, P., & Murray, D. (2019). "Independent Report on the London Metropolitan Police Service's Trial of Live Facial Recognition Technology." University of Essex Human Rights Centre.
- Grother, P., Ngan, M., & Hanaoka, K. (2019). "Face Recognition Vendor Test (FRVT) Part 3: Demographic Effects." National Institute of Standards and Technology.

- Kumar, R. (2021). "Predictive Policing in India: Opportunities and Challenges." *Journal of Policing Studies*, 8(3), 234-256.
- Liang, F., Das, V., Kostyuk, N., & Hussain, M. M. (2018). "Constructing a Data-Driven Society: China's Social Credit System as a State Surveillance Infrastructure." *Policy & Internet*, 10(4), 415-453.
- Lyon, D. (2007). *Surveillance Studies: An Overview*. Cambridge: Polity Press.
- Mukherjee, A., & Sharma, R. (2021). "Implementation of Crime and Criminal Tracking Network & Systems (CCTNS) in India: An Assessment." *Policing: An International Journal*, 44(5), 789-805.
- O'Neil, C. (2016). *Weapons of Math Destruction: How Big Data Increases Inequality and Threatens Democracy*. New York: Crown.
- Perry, W. L., McInnis, B., Price, C. C., Smith, S. C., & Hollywood, J. S. (2013). "Predictive Policing: The Role of Crime Forecasting in Law Enforcement Operations." RAND Corporation.
- Sharma, V., & Kumar, A. (2021). "Bias in Facial Recognition Systems: An Indian Perspective." IIT Delhi Technical Report, TR-CS-2021-1

### Government Reports

- Bureau of Police Research and Development (BPR&D). (2021). *Statistics of Police Organisations in India*. Ministry of Home Affairs, Government of India.
- Bureau of Police Research and Development (BPR&D). (2022). *Police Manpower Statistics*. Ministry of Home Affairs, Government of India.
- Comptroller and Auditor General of India (CAG). (2021). *Report on Smart City Mission*. CAG Report No. 17.
- Delhi Police. (2021). *Annual Report 2020-21*. Delhi Police Headquarters.
- Ministry of Home Affairs (MHA). (2021). *Status of Implementation of Safe City Project*. Government of India.
- Mumbai Police. (2021). *Traffic Management Annual Report*. Mumbai Police.
- National Crime Records Bureau (NCRB). (2020). *National Automated Facial Recognition System: Project Document*. Ministry of Home Affairs.
- National Crime Records Bureau (NCRB). (2021). *Crime in India 2020: Statistics*. Ministry of Home Affairs, Government of India.
- National Crime Records Bureau (NCRB). (2022). *Crime in India 2021: Statistics*. Ministry of Home Affairs, Government of India.
- NITI Aayog. (2018). *National Strategy for Artificial Intelligence #AIforAll*. Government of India.
- Telangana Police. (2021). *Annual Report 2020-21*. Telangana State Police.
- Uttar Pradesh Police. (2019). *Kumbh Mela 2019: Technology Deployment Report*. UP Police.
- Uttar Pradesh Police. (2020). *Annual Report 2019-20*. UP Police Headquarters.

### Legal Cases

- Justice K.S. Puttaswamy (Retd.) v. Union of India, (2017) 10 SCC 1 (Supreme Court of India).
- People's Union for Civil Liberties v. Union of India, W.P.(C) 981/2020 (Delhi High Court) [Pending].

### Reports by Civil Society

- Centre for Internet & Society. (2021). *Surveillance and Democratic Freedoms in India*. Bangalore: CIS.
- Internet Freedom Foundation. (2020). *Constitutional and Legal Concerns with Facial Recognition Technology*. New Delhi: IFF.

**News Sources**

- Singh, R. (2020). "Delhi Police's Facial Recognition System Gets It Right Only 2% of Time." *The Indian Express*

