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The Role of AI in Criminal Investigations and Evidence Management

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In the rapidly growing era of technology, AI plays a significant role in easing legal procedures. This research paper will explore the role of AI in criminal investigations and its impact in today's world. By solving ongoing issues including case delays, ineffective investigative methods that hinder thorough investigations, and impartiality concerns, artificial intelligence (AI) technology has the potential to improve the Indian criminal justice system. The research looks at several AI uses, such as predictive policing using tools like the Integrated Criminal Justice System (ICJS) and the Crime Criminal Analytics and Prediction System (CAPS). The paper will emphasize the advantages that AI provides to have proper enforcement of the law with a focus on risk assessment related to criminal activity and suspicious conduct. It addresses the complex problem of algorithmic presumptions and provides insight into how these biases could influence the decision-making processes implemented in the criminal justice system. The study provides additional insight into how AI technologies, such as face recognition and digital evidence analysis, improve effective criminal investigation and evidence processing through case studies and examples.

Moreover, the research explores how artificial intelligence is transforming evidence management and thoroughly examines the legal issues with the admissibility of evidence that is produced by AI in court. In conclusion, this paper provides an analysis of how artificial intelligence is developing within the regulatory environment of criminal investigations, providing suggestions for addressing this complex and dynamic interplay between justice and technology advancements in the Indian judicial system.

Keywords: *artificial intelligence, criminal investigations, penal code, predictive.*

INTRODUCTION

Object and Purpose of the Study

A paradigm shift in how we approach and resolve criminal matters is being brought about by AI's participation in criminal investigations and evidence management. Artificial Intelligence (AI) is developing into a key instrument for improving numerous aspects of the criminal justice system in the field's dynamic environment as Artificial intelligence (AI) has emerged as a transformative force in the field of criminal justice, with the potential to significantly impact the Indian Penal Code¹ (IPC) and the broader legal landscape in India. AI technologies, such as machine learning and data analytics, are being increasingly integrated into various facets of the criminal justice system to enhance efficiency, accuracy, and fairness. This introduction provides an overview of how AI is being leveraged within the context of the Indian Penal Code, from predictive policing and crime analysis to evidence management and legal research.

Among these are persistent case backlogs, inefficient investigation processes, and concerns surrounding fairness and transparency. In recent years, the integration of Artificial Intelligence (AI) has offered promising solutions to alleviate these issues. This paper endeavours to provide an in-depth exploration of AI's applications within the IPC framework, its multifaceted implications, challenges, and opportunities for reform in the context of India's criminal justice system.

AI applications can be found in many aspects of our lives, from agriculture to industry, communications, education, finance, government, service, manufacturing, medicine, and transportation. Law enforcement agencies and legal professionals may make use of a variety of cutting-edge technologies provided by AI, which is powered by machine learning and data analytics, to simplify investigations, improve the analysis of available evidence, and ultimately guarantee efficient and impartial administration of justice.

¹ Indian Penal Code 1860

AI is being researched as a public safety resource in numerous ways, from predictive policing, which supports law enforcement in developing preventative measures, to DNA analysis, which reveals the complexities of genetic evidence and transforms criminal investigations and decision-making. This paper will explore the intriguing world of artificial intelligence in criminal justice, emphasizing its revolutionary potential, the difficulties it addresses, and the opportunities it provides in the context of law enforcement and the judicial system.

AI IN SHAPING THE LANDSCAPE OF CRIMINAL INVESTIGATIONS

In the ever-evolving landscape of law enforcement and criminal justice, the incorporation of artificial intelligence (AI) and predictive analytics has emerged as an innovative force in India. This Section will examine the possible benefits and difficulties of implementing AI-driven technology in several areas of the criminal justice system in India. The conversation dives into particular programs like the Crime Criminal Analytics and Prediction System (CAPS) ² and the Integrated Criminal Justice System (ICJS), with an emphasis on predictive policing, case management, and crime identification through evidence analysis.

Predictive Policing: AI's Potential in Indian Law Enforcement

In India, there are several potential advantages to using AI and predictive analytics in the criminal justice system. By better-assessing risks, these technologies can increase the effectiveness of criminal investigations, promote public safety, and lessen decision-making bias.

AI-driven predictive policing models, drawing insights from historical crime data, possess the capability to predict and anticipate future criminal activities.³ This facilitates law enforcement agencies in strategically allocating resources, thereby proactively addressing criminal activity, in alignment with the IPC's objective of maintaining law and order. Nonetheless, issues with algorithmic bias have been brought up since it might provide unfair or discriminating outcomes. This section of the paper will examine how algorithmic bias manifests within AI-driven

² Fatima Dakalbab et al., 'Artificial intelligence & crime prediction: A systematic literature review' (2022) 6(1) Social Sciences & Humanities Open <<https://doi.org/10.1016/j.ssaho.2022.100342>> accessed 08 December 2023

³ Soumitra Bose, 'A Silver Bullet for Cops: Crime-Predicting AI Tool: Mumbai News' *The Times of India* (25 August 2018) <<https://timesofindia.indiatimes.com/city/mumbai/a-silver-bullet-for-cops-crime-predicting-ai-tool/articleshow/65536902.cms>> accessed 08 December 2023

predictive policing models in India establishing and evaluating the consequences for law enforcement procedures.

The innovative potential of AI and predictive analytics to improve objectivity and minimize bias in decision-making processes. For instance, in India, advanced systems like the Crime Criminal Analytics and Prediction System (CAPS), created by the Odisha police⁴ as part of the Crime and Criminal Tracking Network and Systems (CCTNS), use machine learning algorithms to predict the likelihood that a suspect will elude capture. Automation ensures a more objective approach by reducing the dependence on judges' and law enforcement officials' opinions.⁵ Additionally, the National Crime Records Bureau (NCRB) in India uses artificial intelligence (AI) within the CCTNS to gather and analyze crime data nationally, assisting in identifying high-risk persons, such as repeat offenders and known criminals, eventually leading to the development of public safety.

Another illustration of predictive analytics and AI mitigating bias in decision-making involves predicting the probability of a suspect committing further offences. The 'Integrated Criminal Justice System' (ICJS), an AI-based platform that builds a thorough profile of a suspect by taking into account elements like their criminal history and social media involvement, has been used by the Telangana police in India⁶. This approach allows law enforcement to decide with confidence whether a suspect qualifies for bail or parole, encouraging a more equitable and data-driven decision-making process inside the criminal justice system.⁷

The incorporation of artificial intelligence (AI) in predictive policing within the sphere of Indian law enforcement involves numerous obstacles. One of the major challenges is the quality and potential bias in the data available for training AI models.⁸ Due to the scarcity of objective, high-

⁴ Smriti Srivastava, 'Odisha Police to Use AI and Mobile Computing to Analyze Crime Data' (*Analytics Insight*, 01 January 2019) <<https://www.analyticsinsight.net/artificial-intelligence/odisha-police-to-use-ai-and-mobile-computing-to-analyse-crime-data>> accessed 08 December 2023

⁵ Debabrata Mohapatra, 'AI-Based Search Engine to Help Cops Gather Data: Bhubaneswar News - Times of India' *The Times of India* (14 February 2023) <<https://timesofindia.indiatimes.com/city/bhubaneswar/ai-based-search-engine-to-help-cops-gather-data/articleshow/97899740.cms>> accessed 06 December 2023

⁶ 'Integrated Criminal Justice System to Be First Launched in Telangana, Andhra Pradesh' *NDTV* (17 July 2016) <<https://www.ndtv.com/south/integrated-criminal-justice-system-to-be-first-launched-in-telangana-andhra-pradesh-1432557>> accessed 30 November 2023

⁷ *Ibid*

⁸ 'Predictive Policing and Crime Prevention: The Role of AI' (*INDIAai Portal*, 21 August 2023) <<https://indiaai.gov.in/article/predictive-policing-and-crime-prevention-the-role-of-ai>> accessed 30 November 2023

quality data, algorithms may perpetuate past biases seen in crime statistics, producing biased predictions. Furthermore, a major obstacle to the successful use of AI-driven predictive policing is resource limitations. Sufficient technological infrastructure and budgetary constraints might impede the implementation of advanced artificial intelligence systems. Moreover, a lack of training opportunities regarding the efficient use and interpretation of AI-generated insights by law enforcement officers may make it more difficult to successfully incorporate these technologies into routine police procedures.⁹

As demonstrated by initiatives like the Integrated Criminal Justice System (ICJS) and the Crime Criminal Analytics and Prediction System (CAPS), AI-driven solutions may help create a more equitable and effective criminal justice system. Adopting these innovations is essential for accomplishing the goals stated in the Indian Penal Code¹⁰ (IPC) and creating a society that is safer and more just. Implementing an integrated strategy is necessary to address AI concerns in Indian law enforcement. The benefits of predictive policing must be weighed against the protection of individual rights, which means that the social, legal, and ethical ramifications of using AI responsibly and ethically in crime prevention must be carefully considered.

Case Management and Analysis: Streamlining Legal Proceedings

AI-powered case management systems are designed to automate administrative tasks, streamline document management, and facilitate seamless communication within the justice system. ¹¹This heightened efficiency reduces case delays, bolsters transparency, and expedites legal proceedings, thereby upholding the IPC's mandate of timely justice.

Artificial intelligence (AI) solutions have a broad range of forms, from machine learning models that anticipate outcomes based on data patterns to automated document analysis systems that use natural language processing. These technologies, when used with the appropriate software configuration, can rapidly detect trends or variations in huge datasets and produce detailed

⁹ Ramachandran Murugesan, 'Predictive policing in India: Detering crime or discriminating minorities?' (*LSE Human Rights Blog*, 16 April 2021) <<https://blogs.lse.ac.uk/humanrights/2021/04/16/predictive-policing-in-india-detering-crime-or-discriminating-minorities/>> accessed 01 December 2023

¹⁰ Indian Penal Code 1860

¹¹ 'How AI Improves Next-Gen Case Management Systems' (*Eccentex*, 19 April 2023) <<https://www.eccentex.com/2023/04/19/how-ai-improves-case-management-systems/>> accessed 04 December 2023

reports that cannot be produced by manual examination. They can also be incorporated into already-used workflow management tools to help teams efficiently assign duties to one another.

Furthermore, the lack of comprehensive data protection regulations in India worsens privacy problems and raises questions regarding the security of citizen data utilized in predictive policing.¹² Ethical concerns are made more difficult by public anxiety about potential abuse by law enforcement forces.¹³ The absence of strong legal frameworks raises concerns about responsibility for the use of AI in law enforcement, making legal and ethical issues urgently necessary. As opacity in predictive policing algorithms may cause public mistrust and ethical issues, particularly in situations of errors or biases, algorithmic openness is essential for fostering confidence.¹⁴ Diversity in culture and geography increases complexity, necessitating a sophisticated strategy to guarantee cross-cultural sensitivity in the creation and use of AI models.¹⁵

Legal departments are now offered a wide range of AI solutions catered to their requirements. These options—commercial off-the-shelf and custom-developed—present the legal sector with a chance to completely transform their business practices. AI technology allows legal professionals to refocus their energies on strategic objectives while boosting accuracy and efficiency, whether through effective document analysis, predictive legal analytics, or automation of repetitive operations.¹⁶ Open-source projects can offer affordable solutions for businesses with tight budgets. The implementation of AI is becoming a need in the cutthroat legal market of today. Legal departments may streamline their operations with AI technology, improve data-driven decision-making, and provide clients with speedier, more accurate services. Legal practitioners may focus on important duties, such as strategy creation and client-focused initiatives, by automating repetitive operations and increasing analytical capabilities. Adopting AI not only

¹² Dan Raywood, 'India Data Protection Bill Approved, Despite Privacy Concerns' *Dark Reading* (*Dark Reading*, 09 August 2023) <<https://www.darkreading.com/data-privacy/india-data-protection-bill-passed-despite-privacy-concerns>> accessed 10 December 2023

¹³ Predictive Policing and Crime Prevention: The Role of AI (n 8)

¹⁴ Antara Vats, 'Building the case for restricted use of predictive policing tools in India' (2022) 32(11) *International Review of Information Ethics* <<https://doi.org/10.29173/irrie487>> accessed 02 December 2023

¹⁵ 'Impact of ai on content diversity and cultural sensitivity' (*Faster Capital*, 02 October 2023) <<https://fastercapital.com/content/Impact-of-ai-on-content-diversity-and-cultural-sensitivity.html>> accessed 09 December 2023

¹⁶ 'Legal AI tools: Essential for attorneys' (*Thomson Reuters*, 31 January 2024) <<https://legal.thomsonreuters.com/blog/legal-ai-tools-essential-for-attorneys/>> accessed 09 December 2023

gives legal departments a competitive edge but also portrays them as cost-effective, forward-thinking businesses ready to meet the needs of the contemporary legal market.¹⁷

Investigations have several difficulties with crime detection and evidence processing that affect accuracy and dependability. Initially, since technology develops quickly, law enforcement must keep up with the latest tools and expertise to combat the threat of criminals adapting to more complex approaches. The sheer amount of digital data created presents difficulties in processing, storing, and analyzing it, sometimes exceeding available resources for research.¹⁸

Another major obstacle is the problem of data integrity and quality. It is imperative to guarantee the accuracy of evidence collection, preservation, and analysis, since any deviation from these processes may result in erroneous findings or legal disputes. The fairness of investigations and court cases can be seriously impacted by inaccuracies in evidence analysis, regardless of whether they are the result of human mistakes or defective technology.¹⁹ As crimes increasingly cross national borders, interconnected global criminal networks present further obstacles. Law enforcement agencies must cooperate and share information, but bureaucratic, legal, or cultural barriers may make this difficult.²⁰

Case study: United States v Rio Tinto case

Rio Tinto, a global mining firm, was accused of engaging in corrupt activities in the United States v Rio Tinto²¹ case. The business managed the huge amount of electronic data involved in the case by using sophisticated e-discovery technologies driven by AI. With the use of these technologies, the discovery process was sped up, important information was found, and the time and expense

¹⁷ ‘Harnessing The Power of Legal Automation to Streamline Workflows’ (*computronix*) <https://computronixusa.com/harnessing-the-power-of-legal-automation-to-streamline-workflows/#Creating_An_Intelligent_Workflow_System> accessed 09 December 2023

¹⁸ Sweekruthi K and Varsha Gowda, ‘The missing piece: Forensics in criminal investigation, *Deccan Herald* (Karnataka, 18 September 2022) <<https://www.deccanherald.com/india/the-missing-piece-forensics-in-criminal-investigation-1146042.html>> accessed 12 December 2023

¹⁹ Amol Yadav, ‘Forensic Science and Its Development in India’ (2023) 5(3) *Law Audience Journal* <<https://www.lawaudience.com/wp-content/uploads/2023/08/Forensic-Science-and-Its-Development-in-India.pdf>> accessed 12 December 2023

²⁰ ‘Transnational Organized Crime: A Growing Threat to National and International Security’ (*National Security Council*) <<https://obamawhitehouse.archives.gov/administration/eop/nsc/transnational-crime/threat>> accessed 15 December 2023

²¹ *Ibid*

of human review were decreased.²² The application of AI in e-discovery for this case demonstrated how technology might be helpful in effectively managing large-scale document review duties, despite certain difficulties.

However, investigators have difficulties due to privacy issues and regulatory restrictions on the gathering and use of specific data types, particularly in the context of developing technologies like biometrics and facial recognition. It is a constant struggle to find a balance between upholding individual rights and utilizing technology for criminal detection.

Artificial intelligence (AI) tools including face recognition and digital evidence analysis, help law enforcement identify suspects and process evidence more quickly, which supports the objectives of the Criminal Justice System's investigations. However, problems still exist, like handling massive amounts of digital data, maintaining data integrity, and handling privacy issues. While promising, the use of AI-driven face recognition calls for a thorough evaluation of the ethical and legal ramifications to reconcile individual liberties with the improvements in crime detection technology.

Crime Detection and Evidence Analysis: Precision in Investigation

AI technologies, encompassing facial recognition and digital evidence analysis, bolster law enforcement agencies' capacity to identify suspects and process evidence efficiently. This aligns with the Criminal Justice System's core objective of facilitating accurate and effective criminal investigations. With the use of digital evidence, a person's activities—including movement across time and interactions—can be meticulously recreated.²³ In addition to basic information like time and location, certain digital devices also record biometric traits that can be utilized for forensic and investigative purposes.²⁴ Digital forensic investigations can find links that conventional forensic disciplines are unable to, and they may prevent crimes before they happen

²² Shannon Capone Kirk et. al., 'E-Discovery Team Examines AI Pitfalls and Best Practices in Court Filings' (*Ropes and Gray*, 2 August 2023) <<https://www.ropesgray.com/en/news-and-events/news/2023/08/e-discovery-team-examines-ai-pitfalls-and-best-practices-in-court-filings>> accessed 11 December 2023

²³ 'Process of Digital Forensics' (*Precise Digital*, 13 February 2020) <<https://precisedigital.com/process-of-digital-forensics/>> accessed 17 December 2023

²⁴ *Ibid*

by intercepting them while they are being planned. The use of artificial intelligence is enhancing these powerful abilities.²⁵

One particular AI application — facial recognition — can be found everywhere in both the public and the private sectors.²⁶ Intelligence analysts, for example, often rely on facial images to help establish an individual's identity and whereabouts. Examining the huge volume of possibly relevant images and videos in an accurate and timely manner is a time-consuming, painstaking task, with the potential for human error due to fatigue and other factors. Unlike humans, machines do not tire. Through initiatives such as the Intelligence Advanced Research Projects Activity's Janus computer-vision project²⁷, analysts are performing trials on the use of algorithms that can learn how to distinguish one person from another using facial features in the same manner as a human analyst.²⁸

Further, the police are implementing AI face recognition, which would make it easier to track down offenders. The potential for real-time facial recognition to reduce crime is tremendous. This technology has made significant strides; therefore, it is gradually starting to expand. This new tracking system needs access to several various databases to operate effectively. And this information ought to include a variety of places and faces. The data must include faces with an array of skin appearances, taken from varied perspectives and with a range of lighting conditions. These factors can all increase the algorithm's accuracy.²⁹ This technology can be more effectively used by the police to find a criminal in a congested spot. They must first submit a photo of the criminal into the AI-driven monitoring system. The city's whole territory is scanned by cameras, which come into action. All faces that the cameras identify would be analyzed and compared by

²⁵ Paul Reedy, 'Interpol review of digital evidence for 2019–2022' (2023) 6 *Forensic Science International: Synergy* <<https://doi.org/10.1016/j.fsisyn.2022.100313>> accessed 12 December 2023

²⁶ 'Automated Facial Recognition in the Public and Private Sector' (*Office of Privacy Commissioner of Canada*, 31 October 2014) <https://www.priv.gc.ca/media/1765/fr_201303_e.pdf> accessed 12 December 2023

²⁷ 'Janus Facial Recognition' (*Intelligence Advanced Research Projects Activity*, 05 July 2021) <https://www.iarpa.gov/images/OA-Slicksheets/JANUS_SlickSheet_FINAL_5072021_Prepubapproved.pdf> accessed 12 December 2023

²⁸ *Ibid*

²⁹ Collin Grosa and Jeremy Straubb, 'Human face images from multiple perspectives with lighting from multiple directions with no occlusion, glasses and hat' (2018) 22 *Data in Brief* <<https://doi.org/10.1016/j.dib.2018.12.060>> accessed 12 December 2023

the cameras. If the surveillance detects a match in the crowd, an alarm is triggered. The perpetrator might be captured by the police once they arrive at the precise location.³⁰

Privacy problems and ethical dilemmas are only two of the many difficulties that face facial recognition technology. The potential for misuse or abuse is a significant issue as the technology can violate people's right to privacy.³¹ Facial data collection and storage raises questions since it can result in the building of extensive monitoring databases without the informed permission of the persons involved. Fairness concerns and possible discrimination are raised by the possibility of bias in facial recognition systems, which might provide misleading findings, particularly for particular demographic groups. Another major issue with the technology is its vulnerability to spoofing or manipulation, in which people employ tricks to trick the system. The appropriate development and application of facial recognition technology continue to face a significant challenge: striking a balance between privacy protection and security advantages.³²

The application of AI, especially face recognition, improves crime detection and provides accuracy in investigations. Despite the tremendous possibilities offered by these technologies, concerns about possible misuse, ethical quandaries, and privacy continue to exist. Responsible growth necessitates a careful balancing act between individual rights and security advantages. To maintain public confidence and fully utilize these instruments in supporting impartial and truthful criminal investigations, cooperative efforts in creating explicit rules and resolving prejudices are essential.

TRANSFORMING EVIDENCE HANDLING THROUGH AI ADVANCEMENTS

Artificial Intelligence (AI) has become a transformational force in evidence management in the ever-changing world of law enforcement and court procedures. Three major pillars comprise this paradigm shift: ensuring the integrity and admissibility of AI-generated evidence, integrating AI into digital forensics, and automating the collection and processing of evidence. while taken as

³⁰ 'Face-detection cameras to catch crooks in the crowd' *Times of India* (09 October 2017) <http://timesofindia.indiatimes.com/articleshow/60997937.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst> accessed 12 December 2023

³¹ '7 Biggest Privacy Concerns Around Facial Recognition Technology' (*Liberties*, 22 October 2022) <<https://www.liberties.eu/en/stories/facial-recognition-privacy-concerns/44518>> accessed 13 December 2023

³² Linda Rosencrance, 'Privacy and security issues associated with facial recognition software' (*Tech Republic*, 25 August 2022) <<https://www.techrepublic.com/article/privacy-and-security-issues-associated-with-facial-recognition-software/>> accessed 13 December 2023

a whole, these components upend the conventional method of managing evidence and provide a range of options to improve effectiveness, precision, and moral concerns while pursuing justice. This section of the paper will analyse how this technology convergence is transforming the management of evidence in modern judicial systems.

An innovative way to improve and expedite the many phases of evidence processing and gathering is to automate evidence management through the application of artificial intelligence (AI) technology.³³ Automating evidence management through the application of artificial intelligence (AI) technology involves leveraging AI-powered systems to streamline and enhance various aspects of evidence processing and management. This includes tasks such as rapidly pinpointing relevant evidence, transcribing conversations, translating languages, redacting confidential information, and analysing digital evidence.³⁴ A significant application is the efficient removal of text from a broad range of sources, such as documents, photos, and videos, using Optical Character Recognition (OCR).³⁵ Law enforcement organizations may now more quickly and accurately classify and sift through textual evidence. In addition, AI-driven object recognition skills are essential for automating the classification of visual evidence, which enables the expeditious identification and arrangement of relevant data.

Case Study: The Veritone Evidence AI-Powered Solution

The administration of evidence for law enforcement companies is revolutionized by Veritone Evidence, an inventive artificial intelligence system.³⁶ This innovative technology offers a single, CJIS-compliant environment by fusing powerful media management with AI cognitive functions.³⁷ Evidence processing takes far less time and money because of the streamlining of important activities including object identification, translation, redaction, and transcription. Veritone Evidence, which has been used by organizations such as the San Diego County District Attorney's Office, has had a significant impact on productivity as it enhances the capacity of

³³ Mustafa Khan, 'Rethinking Digital Evidence Management with Artificial Intelligence' (*Vidizmo*, 04 October 2023) <<https://blog.vidizmo.com/rethinking-digital-evidence-management-with-ai>> accessed 13 December 2023

³⁴ Sam Claybrook, 'Overcoming the Top Challenges of Digital Evidence Management' (*Veritone*, 16 November 2023) <<https://www.veritone.com/blog/overcoming-the-top-challenges-of-digital-evidence-management/>> accessed 14 December 2023

³⁵ Janus Facial Recognition (n 27)

³⁶ Claybrook (n 34)

³⁷ *Ibid*

investigators to find relevant information inside large datasets quickly and precisely, hence streamlining the evidence management process as a whole.³⁸

AI makes a substantial contribution to the field of audio evidence with its speech-to-text and transcription features. By translating speech into text, advanced audio analysis makes it easier to index and retrieve data from audio recordings such as phone conversations, interviews, and other recordings. Additionally, by collecting pertinent information, evaluating textual content, and finding correlations within the data, Natural Language Processing (NLP) improves the processing of evidence.

Case Study: AI Waveform Analysis in Audio Forensics

Audio forensics has been transformed by AI waveform analysis, which has improved reliability, accuracy, and efficiency.³⁹ With this technology, audio data can be processed and analysed quickly, which makes it easier for investigators to identify substantial proof. AI systems have reduced the margin of error in detecting certain aspects inside recordings by precisely recognizing and classifying sounds thanks to huge audio databases that have been trained on them. Even though AI is a potent tool, working with forensic specialists is still essential to ensuring that evidence is presented in court accurately and morally, accepting AI as an addition to human knowledge.⁴⁰

Another critical component of evidence management that gains from AI automation is metadata tagging. Metadata tagging is the process of systematically assigning descriptive tags to digital assets, typically using a rules-based system to ensure consistency. These tags can contain a wide range of data, including the item's colour, the name of the author or creator, the creation date, keywords, and descriptions.⁴¹ Picklists, field-level text, taxonomy, and keywords are a few methods for metadata tagging. This procedure is essential to contemporary information management since it increases the relevancy of digital assets for users and search engines alike,

³⁸ Christopher Rigano, 'Using Artificial Intelligence to Address Criminal Justice Needs' (*National Institute of Justice*, 08 October 2018) <<https://nij.ojp.gov/topics/articles/using-artificial-intelligence-address-criminal-justice-needs>> accessed 12 December 2023

³⁹ Mvelo Mcuba et. al., 'The Effect of Deep Learning Methods on Deepfake Audio Detection for Digital Investigation' (2023) 219 *Procedia Computer Science* <<https://doi.org/10.1016/j.procs.2023.01.283>> accessed 15 December 2023

⁴⁰ How AI Improves Next-Gen Case Management Systems (n 11)

⁴¹ 'Metadata Management: Process, Tools, Use Cases, and Best Practices' (*Altex Soft*, 09 September 2022) <<https://www.altexsoft.com/blog/metadata-management/>> accessed 15 December 2023

boosts search engine rankings, and ensures consistency and effectiveness in the handling of digital content. Artificial intelligence (AI) may also be used to automate metadata tagging, which can increase accuracy and save time. Information is arranged and retrieved much more easily when metadata tags are automatically assigned by algorithms.⁴² This methodology guarantees the effective classification of evidence according to parameters like time, place, or substance. Additionally, the use of blockchain technology strengthens the integrity and reliability of the evidence throughout the investigation by offering a safe and irrevocable record of the link of custody.⁴³ By using AI's capacity for pattern recognition, anomaly detection helps investigators find anomalies or possible areas of interest in massive datasets. AI-powered predictive analytic models can predict trends and patterns from past data, providing useful information for case creation and resource allocation. Another interesting use is automated case ranking, in which AI systems evaluate variables like urgency and complexity to maximize investigative efforts.⁴⁴

Case Study: AI Auto-Tagging in Digital Asset Management

Artificial intelligence (AI) technologies are crucial to the field of multimedia evidence. Using photos or videos, facial recognition software may be used to identify people and perhaps link them to databases or other instances.⁴⁵ Video analytics provide investigators with more context and information by enabling the automatic detection and monitoring of objects, persons, or events inside video footage. By building knowledge graphs, artificial intelligence (AI) helps collaborative efforts by illustrating the connections between various pieces of information.⁴⁶ This encourages effective information exchange and teamwork among investigators. By automatically identifying possible mistakes or inconsistencies and verifying the veracity and correctness of the evidence, quality control is further improved.

⁴² Geoffrey Bock, 'How does AI aid in metadata tagging?' (*Tech Target*, 06 June 2019) <<https://www.techtarget.com/searchcontentmanagement/answer/How-does-AI-aid-in-metadata-tagging>> accessed 14 December 2023

⁴³ Kaitlyn Levinson, 'How to make skills-based hiring work' (*Route Fifty*, 15 December 2023) <<https://www.route-fifty.com/management/2023/12/how-make-skills-based-hiring-work/392805/?oref=rf-home-top-story>> accessed 17 December 2023

⁴⁴ How AI Improves Next-Gen Case Management Systems (n 11)

⁴⁵ Abid Haleem et. al., 'Artificial intelligence (AI) applications for marketing: A literature-based study' (2022) 3 *International Journal of Intelligent Networks* <<https://doi.org/10.1016/j.ijin.2022.08.005>> accessed 13 December 2023

⁴⁶ Rafael Sacks et. al., 'Building Information Modelling, Artificial Intelligence and Construction Tech' (2020) 4 *Developments in the Built Environment* <<https://doi.org/10.1016/j.dibe.2020.100011>> accessed 13 December 2023

The application of AI in the legal and criminal justice setting may significantly improve evidence management; nevertheless, there are significant ethical and data privacy concerns that must be taken into account, as well as the need to preserve accountability and openness.

LEGAL AND ETHICAL CONSIDERATIONS IN AI DEPLOYMENT

With artificial intelligence (AI) developing so quickly, legal and ethical issues must be carefully considered before deploying new technologies. As AI gets increasingly integrated into society, privacy, prejudice, accountability, and transparency are becoming increasingly issues. This section explores the potential and problems raised by the deployment of AI, delving into the intricate interplay of law and ethics. Fostering responsible and fair AI activities requires an awareness of the complex ecosystem, which includes ethical principles and legal frameworks. The delicate interplay between AI technologies and the moral and legal frameworks that regulate them requires striking a balance between innovation and the betterment of society.

Admissibility of AI-generated Evidence in Court

The legality of AI-generated evidence is a complicated and evolving subject. The increasing use of AI technology in judicial procedures presents a challenge for legislators and judges to assess the reliability, dependability, and potential biases of the evidence. For example, laws have been created in certain jurisdictions that prohibit AI-generated evidence from being admitted into criminal trials unless it is substantiated by evidence that is both independent and acceptable.⁴⁷ Judges also have to take into account the necessity of expert testimony, protective orders, and the possibility of undue bias or misleading the jury.⁴⁸ Legal institutions must modify their strategies as AI technology advances to guarantee the impartial and correct evaluation of AI-generated evidence in court.

⁴⁷ Daniel Seng, Stephen Mason, 'artificial intelligence and evidence' (2021) 33 SAclJ <<https://journalsonline.academypublishing.org.sg/Journals/Singapore-Academy-of-Law-Journal-Special-Issue/Current-Issue/ctl/eFirstSALPDFJournalView/mid/503/ArticleId/1602/Citation/JournalsOnlinePDF>> accessed 12 December 2023

⁴⁸ Jule Pattison-Gordon, Judges Must Weigh Admissibility of AI Evidence (2023) JUSTICE AND PUBLIC SAFETY <<https://www.govtech.com/public-safety/judges-must-weigh-admissibility-of-ai-evidence>> accessed 13 December 2023

Case Study: New York's A8110 Legislation

In response to concerns about AI-generated evidence, New York enacted Bill⁴⁹ A8110, prohibiting its admissibility in criminal proceedings without substantial support from independent, admissible sources.⁵⁰ This pioneering legislation defines the criteria for independent and admissible evidence, aligns standards across civil and criminal proceedings, and mandates judicial scrutiny. The law aims to enhance reliability, ensure consistency, and foster a cautious approach in the evolving landscape of AI integration in the legal system, setting a precedent for jurisdictions worldwide.

Addressing AI-generated evidence's admissibility in criminal trials, Australia does not yet have any explicit regulation in effect. However, the obstacles posed by AI-generated evidence have proven challenging for the Australian judicial system to handle, and some jurisdictions have passed legislation to deal with these problems. The New South Wales Law Reform Commission (NSWLRC),⁵¹ for instance, has created a set of guidelines for AI regulation that may affect whether or not AI-generated evidence is admissible in court.⁵²

Authenticity is yet another crucial factor. The assurance that the AI-generated evidence has not been altered or tampered against is a requirement for courts.⁵³ It is crucial to guarantee the accuracy of the algorithms and the data they use. The court may evaluate the security protocols of an AI system that analyses digital communications as evidence, for example, to avoid unwanted access or manipulation. Reliability is perhaps the most contentious aspect. Initially, the scientific or technological concepts that supported the evidence's development have been used by courts to assess its legitimacy.⁵⁴ Determining the dependability of AI may need

⁴⁹ *Ibid*

⁵⁰ James E. Baker et. al., 'AI for Judges: A Framework' (*CSET Policy Brief*, 30 November 2021) <<https://www.armfor.uscourts.gov/ConfHandout/2022ConfHandout/Baker2021DecCenterForSecurityAndEmergingTechnology1.pdf>> accessed 08 December 2023

⁵¹ Philip Chung et.al., 'Open Justice and Free Access to Case Law (A Submission to the NSW Law Reform Commission)' (2021) SSRN <<https://dx.doi.org/10.2139/ssrn.3798994>> accessed 15 December 2023

⁵² Graham Greenleaf et.al., 'Regulation of (Generative) AI Requires Continuous Oversight (2023) UNSW Law & Justice Research Series <<https://dx.doi.org/10.2139/ssrn.4519365>> accessed 15 December 2023

⁵³ Daniel Seng and Stephen Mason, 'Artificial intelligence and evidence' (2021) 33 *Singapore Academy of Law Special Issue on Law and Technology* <<https://journalonline.academypublishing.org.sg/Journals/Singapore-Academy-of-Law-Journal-Special-Issue/Current-Issue/ctl/eFirstSALPDFJournalView/mid/503/ArticleId/1602/Citation/JournalsOnlinePDF>> accessed 12

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⁵⁴ Paul W. Grimm et.al., 'Artificial Intelligence As Evidence' (2021) 19(1) *Northwestern Journal of Technology and Intellectual Property*

knowledge of the training set, algorithms, and system performance as a whole. For example, if an AI tool has been used to recognize voices during court hearings, the system's accuracy and overall dependability would be closely monitored. Courts must decide whether human and machine actions were legal requirements or carried out as intended when evaluating the scientific quality of evidence, and they frequently apply the Daubert standard to do so.⁵⁵

Legal systems are attempting to overcome these issues to guarantee the integrity of AI-generated evidence in court since the technology's changing nature makes it challenging to authenticate evidence.⁵⁶

Case Study: AI in Indian Courts by Balancing Skepticism and Integration⁵⁷

As AI, including ChatGPT, continues to transform sectors globally, India's legal landscape remains cautious. In the case of *Christian Louboutin SAS & Anr. v M/s The Shoe Boutique – Shutiq*, the Delhi High Court emphasized that AI, in its current state, cannot replace human intelligence in adjudication. The court's scrutiny of ChatGPT's responses questioned AI's reliability for legal or factual matters. While not outrightly banning AI, the ruling advocates for its limited role, aligning with recent US decisions. As India cautiously embraces AI, there's a growing need for regulations to guide responsible AI usage in legal proceedings.

Considerations of AI-generated evidence can provide issues, especially in the areas of criminal justice predictive analytics and face recognition technologies. Algorithms and training data are the basis of facial recognition technology, and there may be concerns about the accuracy of these algorithms as well as any biases in the data. Risk assessment tools for parole decisions, for instance, are examples of predictive analytics techniques that may give rise to questions of fairness, transparency, and possibly discriminatory effects.

<<https://scholarlycommons.law.northwestern.edu/cgi/viewcontent.cgi?article=1349&context=njtip>> accessed 13 December 2023

⁵⁵ Jelsyna Chacko, 'AI-powered lawyers in the context of the Indian legal system: Pitfalls and potential' (*Bar and Bench*, 24 January 2023 2023) <<https://www.barandbench.com/columns/ai-powered-lawyers-in-the-context-of-the-indian-legal-system-pitfalls-and-potential>> accessed 10 December 2023

⁵⁶ Derek Kevra and Dylan Dulberg, 'Burden of Proof: Artificial Intelligence is now disrupting court room evidence' (*Fox 2 Detroit*, 28 September 2023) <<https://www.fox2detroit.com/news/burden-of-proof-the-impact-a-i-has-on-the-court-system>> accessed 13 December 2023

⁵⁷ 'AI in Indian courts – a slow start' (*Majmudar & Partners*, 25 September 2023) <<https://www.majmudarindia.com/ai-in-indian-courts-a-slow-start/>> accessed 15 December 2023

Case Study: Rekognition v MacArthur⁵⁸

With the claim that the county's employment of the Rekognition face recognition system violated the client's constitutional rights, the American Civil Liberties Union (ACLU) filed a lawsuit against the Washington County Department of Public Defence in 2018. The ACLU claimed that the system lacked dependability and that using it in criminal trials violated due process rights in violation of the Constitution case. After the case was resolved, the Washington County Council decided to forbid police enforcement from using face recognition software. This case emphasizes the difficulties and concerns associated with using evidence produced by artificial intelligence, especially when it comes to face recognition technology.⁵⁹

the admissibility of AI-generated evidence in court is a complex and dynamic issue. Legislation establishing admissibility standards is the response from jurisdictions like New York to improve dependability. Australia faces comparable difficulties due to a lack of clear legislation. The vital components of authenticity and dependability necessitate verification of algorithm accurateness and guarantee against manipulation. The primary objective is to guarantee impartial and precise assessments of the evidence presented in court as legal systems across the world adjust to the rapidly changing environment of AI integration.

Ensuring Fairness and Transparency in AI Applications

In particular, when it comes to criminal investigations and evidence management, it is critical to guarantee fairness and openness in AI applications. Artificial intelligence integration in several domains can profoundly impact people's lives as well as the general operation of the legal system. Many significant variables need to be taken into account to respect morals. It entails reducing algorithmic biases and enhancing the interpretability of decision-making procedures. This ethical requirement promotes responsible AI adoption across a range of industries by addressing legal and societal issues in addition to building trust.

⁵⁸ Crockford K, 'How Is Face Recognition Surveillance Technology Racist?' (*American Civil Liberties Union*, 17 July 2023) <<https://www.aclu.org/news/privacy-technology/how-is-face-recognition-surveillance-technology-racist>> accessed 10 December 2023

⁵⁹ 'Assessing the Admissibility of Artificial Intelligence Evidence' (*McCormick School of Engineering*, 09 February 2022) <<https://www.mccormick.northwestern.edu/computer-science/news-events/news/articles/2022/assessing-the-admissibility-of-artificial-intelligence-evidence.html>> accessed 15 December 2023

One critical factor is the quality of data utilized to train AI algorithms. The population that the AI system will engage with has different demographics and features, hence it is imperative to collect varied and representative datasets. Furthermore, proactive steps should be made to detect and correct biases in the data, guaranteeing that groups who are underrepresented or misrepresented receive the appropriate emphasis.⁶⁰

Case study: The Refinitiv 2019 AI/ML Global Study

In the 2019 report, Refinitiv underlines the critical importance of data quality in AI training. It demonstrates how the effectiveness of AI is greatly impacted by high-quality, impartial data, which builds consumer confidence.⁶¹ Taking biases into account, gathering a variety of data, and carefully cleansing the data all become essential components. The study emphasizes the need for enterprises to give data quality top priority to improve the efficacy and dependability of their AI models, which will improve results and boost user confidence.

It is essential to provide accountability and supervision in AI systems, which necessitates defining distinct roles at each stage of development, implementation, and monitoring. Establishing trust in the system, and external examination through third-party audits strengthens adherence to legal and ethical norms.⁶² There must be clear ethical standards about permission, privacy, and individual rights when using AI in criminal justice. Working together with community leaders and legal professionals guarantees a comprehensive ethical foundation. Algorithms must be transparent to strike a balance between security and the revelation of underlying workings. Public and legal trust is increased by offering insights into AI training and decision-making procedures.⁶³ To integrate AI in criminal justice responsibly and morally and to promote trust and equity in its use, this balance must be struck.

⁶⁰ 'Data diversity and why it is important for your AI models' (*Stage Zero Technology*, 26 October 2023) <<https://stagezero.ai/blog/data-diversity-importance-ai/>> accessed 14 December 2023

⁶¹ Altay Ataman, 'Data Quality in AI: Challenges, Importance & Best Practices' (*AI Multiple Research*, 30 October 2023) <<https://research.aimultiple.com/data-quality-ai/>> accessed 14 December 2023

⁶² Yogesh K. Dwivedi et. al., 'Opinion Paper: "So what if ChatGPT wrote it?" Multidisciplinary perspectives on opportunities, challenges and implications of generative conversational AI for research, practice and policy' (2023) 71 *International Journal of Information Management* <<https://doi.org/10.1016/j.ijinfomgt.2023.102642>> accessed 17 December 2023

⁶³ Asma Idder and Stephane Coulaux, 'Artificial intelligence in criminal justice: invasion or revolution?' (*International Bar Association*, 13 December 2021) <<https://www.ibanet.org/dec-21-ai-criminal-justice>> accessed 17 December 2023

Initiatives for education and public awareness are the other crucial factors. Building trust and understanding requires raising public awareness of the use of AI in criminal investigations as well as educating the public, legal experts, and law enforcement agencies on the possible biases and limits of AI systems. The effectiveness of AI systems should be regularly assessed through audits and impact analyses.⁶⁴ By identifying possible biases and opportunities for development, these evaluations assist in guaranteeing that AI applications accomplish their intended purposes without having unintentional negative effects.

Stakeholders may collaborate to create and implement fair, transparent, and responsible AI systems for evidence management and criminal investigations by embracing these concepts. The approach facilitates the development of a fairer and more impartial legal system by harmonizing technical progress with moral principles. Therefore, to promote trust in AI technology and guarantee their appropriate and fair integration into society, it is imperative to tackle these legal and ethical issues. To establish a framework that maintains justice, accountability, and transparency in the age of artificial intelligence, legislators, engineers, and legal experts must work collaboratively.

CONCLUSION

The incorporation of artificial intelligence (AI) into the criminal justice system in India has significant advantages but necessitates careful consideration of ethical and legal aspects. Although case management, evidence analysis, and predictive policing offer efficiency and impartiality, strong governance is necessary to address challenges like algorithmic bias and privacy. Legislators, legal professionals, and engineers need to work together to develop a thorough framework that guarantees the appropriate use of AI. To fully fulfill AI's disruptive potential, a balance between innovation and ethical protections must be struck. Building public trust and promoting a safer and equitable society requires adhering to the justice, fairness, and individual rights values contained in the Indian Penal Code while traversing this route.

Further, the use of artificial intelligence (AI) in criminal justice and evidence management necessitates striking a careful balance between creativity and morality. Veritone Evidence is one example of a technology that demonstrates automated evidence processing and its potential for

⁶⁴ Dwivedi (n 62)

greater efficiency. Comprehensive frameworks are necessary to address legal and ethical difficulties including bias in AI-generated evidence and admissibility requirements. Responsible use of AI technologies requires public awareness campaigns in conjunction with fairness and transparency assurances. Working together, stakeholders must create a framework that maintains justice, accountability, and trust in the AI era as the legal environment changes.