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"NAVIGATING THE INTERSECTION OF ARTIFICIAL INTELLIGENCE AND THE CRIMINAL JUSTICE SYSTEM".

AUTHORED BY - ABHEYSHEK JAMWAL & VASUDHA SHARMA

ABSTRACT

Artificial Intelligence (AI) has revolutionized numerous facets of contemporary society, with significant implications for forensic science and criminal investigation. This abstract encapsulates a comprehensive exploration of AI's role in these domains, synthesized from various prompts. The historical background of AI unveils its evolution since Alan Turing's seminal work in 1950, progressing through pivotal developments in logic, reasoning algorithms, and neural networks. From 1980 onwards, AI witnessed strides in logical rule application and reasoning algorithms, subsequently leading to the emergence of neural network software systems in 1993.

AI's application in criminal justice encompasses a spectrum of functions, including pattern recognition, facial recognition, and crime scene reconstruction. Moreover, AI augments forensic psychology by enhancing risk evaluation and predicting recidivism. The integration of AI technologies facilitates efficient bloodstain pattern analysis, DNA testing, and estimation of post-mortem intervals. Additionally, AI's utilization extends to cyber forensics, multimedia analysis, and forensic data analysis, enabling effective crime prevention and investigation. Forensic odontology benefits from AI-driven dental identification techniques, enhancing accuracy and expediency in mass disaster investigations. Furthermore, AI's capability extends to ballistics analysis, enabling precise identification of ballistic evidence through image processing and neural network applications.

Moreover, AI is instrumental in crime forecasting, enabling law enforcement agencies to predict and preempt criminal activities with enhanced accuracy. Legal solutions and courtroom procedures are also streamlined through AI applications, ensuring efficient communication and evidence presentation. AI's integration empowers forensic experts to address the complexities of modern crime, offering nuanced insights and solutions. While challenges persist, including the need for continuous technological advancements and comprehensive training for stakeholders,

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the pervasive influence of AI in forensic science and criminal investigation is undeniable.

In conclusion, AI represents a transformative force in contemporary forensic science and criminal justice, offering unprecedented capabilities to mitigate crime, enhance investigation procedures, and deliver justice effectively.

KEYWORDS:- Artificial Intelligence (AI), Forensic science, Criminal investigation, Alan Turing, Pattern recognition, Cyber forensics, Crime forecasting , Crime prevention etc.

INTRODUCTION

Advancements in science and technology are rapidly progressing, augmenting human intelligence through machine utilization to achieve more sophisticated outcomes, notably in criminal case investigations. Artificial intelligence offers promising avenues for addressing challenges within the criminal justice domain, particularly in cases where the root cause of the crime is ambiguous. Furthermore, artificial intelligence finds extensive applications across diverse sectors such as agriculture, industry, communication systems, education, finance, manufacturing, transportation, and government services. Its capabilities extend to preventing various violations in transportation systems, thereby ensuring safer and more secure travel experiences.[1]

Artificial intelligence is proving to be invaluable in addressing matters concerning criminal activity, public safety, DNA analysis, gunshot detection, crime prediction, and crime prevention. It can be aptly described as an advanced field within computer science. The concept was initially articulated by John McCarthy, who defined artificial intelligence as the discipline focused on creating intelligent machines[2]. Enabled by artificial intelligence, machines possess the ability to autonomously perceive and react to their surroundings, undertaking complex tasks traditionally associated with human intelligence and decision-making, all without direct human intervention.

[1] *Using Artificial Intelligence Address Criminal Justice Needs*, available at: https://nij.ojp.gov/topics/articles/using-artificial-intelligence-address-criminal-justice-needs/ (Visited on March 02, 2024).

[2] *The Society for the Study of Artificial Intelligence and Simulation of Behaviour, "What is Artificial Intelligence*", available at: https://nij.ojp.gov/topics/articles/using-artificial-intelligence-address-criminal-justice-needs/ (Visited on March 15, 2024).

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HISTORICAL ACCOUNT OF ARTIFICIAL INTELLIGENCE

Although the term "artificial intelligence" may appear to have emerged recently, its roots trace back to a significant and varied history. In 1950, Alan Turing published a groundbreaking paper titled "Creating Thinking Machines"[3] marking an early exploration into the concept. Subsequently, in 1956[4], John McCarthy introduced his paper on Artificial Intelligence. Over the period spanning from 1956 to 1974, there was extensive exploration and discussion surrounding various aspects of artificial intelligence, including decision-making processes, intricate mathematical representations, natural language processing, the development of logical rules for interpreting and generating sentences, and the inception of game theory, exemplified by the creation of rudimentary computer games[5]. Between 1980 and 1987, significant advancements were made in employing logical rules and reasoning algorithms to simulate human expertise. Artificial intelligence began to be utilized by physicians for medical diagnosis, facilitating the formulation of new rules to enhance decision-making[6] processes. The emergence of neural network software systems occurred during the period spanning from 1993 to 2009. These networks were employed for tasks such as identifying intricate patterns and recognizing characters, particularly in license plate readers.Starting from 2010, artificial intelligence has experienced widespread proliferation, evolving into a fully-fledged scientific discipline with the aid of sophisticated software systems. Mimicking networks are now extensively deployed to identify and classify complex patterns across various domains. Software applications have expanded to include automated facial and object detection, recognition, medical image diagnostics, analysis of financial patterns, and governance regulation. Furthermore, artificial intelligence is playing a crucial role in Defense Advanced Research Projects[7], illustrating its broadening scope and significance.

MEANING

Artificial intelligence represents a cutting-edge innovation, constituting a significant field within software engineering aimed at enabling machines to emulate human capabilities. It entails a remarkable fusion of human intellect and machine prowess, designed to alleviate human workload and delegate various tasks to computers. Essentially, artificial intelligence harnesses the power of the human brain, enabling software programs to leverage structured algorithms to

[3] Alan Turing, "*Computing Machinery and Intelligence*" LIX (236) Mind 433–460 (October 1950).
[4] Supra note 2.
[5] Daniel Crevier, *AI: The Tumultuous Search for Artificial Intelligence* (New York: Basic Books, 1993).
[6] Pamela McCorduck, *Machines Who Think* (Natick, MA: A.K. Peters, Ltd., 2 edn., 2004).
[7] Supra note 1.

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perform tasks. This modern revolution facilitates the automated utilization of machines and facilitates the acquisition of new knowledge and skills.

Artificial intelligence enables machines to engage in various aspects of human cognitive processes, including learning, reasoning, adaptation, self-correction, and rational decision-making. Recent years have witnessed significant advancements in crucial learning algorithms, benefiting applications in criminal investigations, scientific analysis, and the establishment of equitable legal frameworks. The integration of human expertise with machine capabilities in artificial intelligence serves to alleviate functional burdens and extends the scope of operations to previously inaccessible areas, enhancing the ability to uncover the root causes of crimes. Consequently, there exists a profound and symbiotic relationship between artificial intelligence and forensic science.

Artificial intelligence harnesses intelligent agents within software systems to extract crucial data from environments conducive to relevant information, a task that is unfeasible to accomplish manually. Within this realm, machines emulate cognitive functions of humans, extending well beyond mere learning and problem-solving abilities.

ARTIFICIAL NEURAL NETWORKS (ANNS)

Artificial neural networks simulate the operations of the human brain, particularly evident in machine learning and deep learning algorithms. Artificial intelligence involves computer learning without explicit programming instructions. Deep learning refers to the capacity for learning without direct supervision. Artificial neural networks replicate the learning functions of brain neurons using mathematical, computational, or technological methods.

Computing systems, akin to biological neural networks found in human brains, are designed to execute specific tasks or tasks related to them. These tasks may encompass processes such as learning through the recognition of photos or images and utilizing these insights to interpret outcomes. Artificial neural networks undertake the function of image recognition, extracting identifying features from processed instances provided to them.

Forensic science operates on six key principles, including the Law of Individuality, Locard's Principle of Exchange, Principle of Comparison, Principle of Analysis, Principle of Probability, and Law of Progressive Exchange. Locard's Principle of Exchange asserts that when two entities

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interact, they leave traces on each other, a concept extensively applied in forensic science and investigations, as well as in artificial intelligence. This principle is commonly employed throughout the legal process, from crime scenes to courtrooms. Artificial neural networks and artificial intelligence play significant roles in forensic science.

THE APPLICATION OF ARTIFICIAL INTELLIGENCE IN FORENSIC SCIENCE

Forensic science, a discipline within the realm of criminal justice, encompasses the application of scientific principles, methodologies, and techniques. In contemporary times, criminals have adopted increasingly sophisticated systems and methods to perpetrate crimes, often leaving no discernible clues or evidence behind, thereby evading justice. Artificial intelligence aids forensic scientists in providing intricate details and exploring various possibilities to apprehend offenders and uncover the root causes of crimes. The integration of artificial intelligence enhances forensic science by furnishing diverse inputs, consequently enabling courts to accurately identify and punish perpetrators.

Artificial intelligence facilitates the widespread adoption of forensic science techniques across all its branches through the utilization of emerging technologies. It finds application in various aspects such as blood pattern recognition and analysis, crime scene reconstruction, image processing, satellite monitoring, and digital forensics. Termed as machine intelligence, artificial intelligence leverages machines to replicate human cognitive functions, contributing to its efficacy in forensic applications.

Hence, artificial intelligence plays a crucial role in software engineering, security architecture, forensic science, neuroscience, and advanced engineering. It represents a form of artificial cognitive capability, employing machines or software programs to extract insights from complex patterns, thereby achieving outcomes that would otherwise be unattainable.

BENEFITS OF ARTIFICIAL INTELLIGENCE IN FORENSIC INVESTIGATIONS

Artificial intelligence holds significant potential for application in forensic science, offering numerous advantages to forensic experts and technical personnel involved in forensic matters. Some of these benefits include:

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i. Automation facilitated by artificial intelligence enables forensic scientists to save considerable time and resources that would otherwise be spent by investigators analyzing crime scenes.

ii. Artificial intelligence is highly effective in identifying suspicious behavior patterns from extensive datasets comprising videos, images, emails, text files, and more.

iii. The dynamic nature of artificial intelligence methodologies surpasses rule-based testing approaches, which typically focus on single datasets. Instead, artificial intelligence employs a multipronged methodology, enhancing its adaptability and effectiveness.

iv. Through its inherent advantages, artificial intelligence promotes a focused investigative approach, prioritizing pertinent issues over conservative methods that may hinder analytical investigations with localized and obstructive approaches.

THE ROLE OF ARTIFICIAL INTELLIGENCE IN CRIMINAL INVESTIGATIONS

In contemporary criminal investigations and forensic examinations, the indispensable role of artificial intelligence cannot be overstated, paving the way for an impartial judicial system and ensuring fair dispensation of criminal justice. For instance, cases involving murder or the pursuit of perpetrators of sexual abuse pose daunting challenges for law enforcement agencies. The analysis of a single fingerprint may necessitate sifting through vast databases of fingerprints, a task made feasible solely through the assistance of artificial intelligence. By offering digital forensics capabilities and sophisticated techniques for tackling complex issues requiring extensive data processing, artificial intelligence emerges as an invaluable asset.

In numerous instances, an abundance of evidence is available in various forms such as images, videos, audios, fingerprints, and handwriting. Artificial intelligence proves instrumental in efficiently examining such evidence, rendering conventional manual methods obsolete. Traditional approaches are often criticized for their bias, prejudice, incompetence, or lack of comprehensive analysis, leading to erroneous outcomes due to high error rates. Conversely, artificial intelligence offers unparalleled accuracy, scientific rigor, and reliability.

Artificial intelligence significantly bolsters forensic science by enabling forensic analysts to grapple with crimes committed through the use of AI technology or employing sophisticated

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technical and tactical investigation methodologies. It empowers forensic experts to both identify and preempt criminal activities. There is a pressing need to expand the utilization of artificial intelligence systems to handle a wide array of intricate criminal cases. Leveraging artificial intelligence promises expedited processing of a large volume of crimes within minimal time frames.

The adoption of artificial intelligence presents extensive opportunities for employing technical approaches, methodologies, techniques, and recommendations in criminal case investigations.

In Western countries, sophisticated criminals utilize artificial intelligence, posing a challenge that can only be effectively addressed by government criminal justice systems leveraging the same technology. Forensic investigations necessitate comprehensive examination of evidence and extensive information gathering to arrive at logical conclusions. Artificial intelligence offers invaluable support to forensic specialists by facilitating efficient data management and enabling meta-analysis at various levels.

The technology employed by artificial intelligence proves instrumental in constructing data repositories essential for criminal investigations. Its capabilities include pattern recognition, elucidating reasoning processes, minimizing false negatives during analysis, providing insights beneficial for the criminal legal system, aiding in performance assessment, compiling statistical evidence, and establishing methodologies for problem-solving.

UTILIZATION OF ARTIFICIAL INTELLIGENCE

Artificial intelligence finds application in addressing challenges across diverse domains within forensic science. It assists experts in extracting pertinent information from crime scenes, establishing culpability, and mitigating the risk of human error. Additionally, it expedites the generation of accurate results, ensuring seamless progress in forensic investigations. The utilization of artificial intelligence by forensic specialists spans a wide range of areas in contemporary practice.

i. **Identifying Patterns -** Identifying Patterns involves the automatic identification of patterns using various learning techniques to produce output values. It is particularly valuable for detecting trends within extensive datasets. Patterns can be derived from concrete evidence and probabilistic analysis. Examples of patterns include fingerprint images, handwritten words, human faces, or speech signals. It is also employed in

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identifying image patterns for individual or picture recognition, as well as in detecting patterns in email messages or records. Various techniques are utilized in pattern recognition depending on the nature of the data. Leveraging artificial intelligence can mitigate the occurrence of false positives or negatives.

ii. **Forecasting Using Neural Networks in Forensic Psychiatry -** Clinical or behavioral predictions are conducted using machine learning techniques, integrating neuroimaging with artificial intelligence tools or functional brain parameters. This approach is commonly employed to forecast the likelihood of recidivism in forensic psychiatry and criminal justice investigations, where risk assessment holds significant importance. Recent advancements in new devices and methodologies have emerged to enhance risk assessment within the field of forensic psychiatry. These developments enable the accurate differentiation between high-risk and low-risk offenders, facilitating informed decisions regarding sentencing, parole, capital punishment, juvenile court proceedings, and other medico-legal matters.

iii. **Recognition of Human Faces -** Numerous forensic professionals have developed effective systems utilizing neural networks for automated facial recognition. By utilizing a dataset of CT head scans, these systems construct sets of data. Within this framework, endeavors are made to establish an individual's distinct facial space, enabling researchers to evaluate the reconstructed face**.**

iv. **Establishing Data Stores-** Similar to other systems designed to store and organize up-to-date records of data or research, artificial intelligence proves highly beneficial in managing an online repository where all digital forensic investigations, findings, data, assets, and reports can be efficiently maintained. This repository encompasses various storage mediums such as USB drives, hard drives, optical media, and flash drives, capable of accommodating vast volumes of information. Thus, artificial intelligence serves as a valuable resource for legal documents, facilitating the interpretation and explanation of data. Moreover, it possesses the capability to maintain an updated archive of information, literature, and data analysis for legal purposes.

v. **Reconstruction of Crime Scenes Using Virtual Reality-** Artificial intelligence is frequently utilized to construct crime scenes and determine the identity of the perpetrator. This involves the creation of 3D graphical models and animations, allowing for real-time interaction with the reconstructed crime scene. Virtual reality simulations are employed to generate the crime scene, incorporating elements such as

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pathological visualization, murder reconstruction, and evaluation of shooting incidents. The presence of specific objects, such as the victim's body or other materials, is essential at the crime scene. Forensic experts meticulously analyze each input aspect using various animated videos, including manual construction of animated crime scenes.

vi. **Study of Ballistics-** Forensic experts employ artificial neural networks to analyze gunpowder, ammunition, and related materials for comparing bullet marks and firearms, aiming to identify ballistic evidence using image processing techniques. Through image processing, a correlation is established among projectile imprints, firearm identification, and other ballistic materials found at the crime scene, all without manual intervention.

vii. **Analysis of Multimedia-** During multimedia analysis of crime scenes, images, videos, or CCTV footage are utilized for criminal investigations; however, the potential for human error cannot be disregarded. Artificial intelligence proves invaluable in such investigations by recording attributes like eye shape, eye color, and distance between the eyes for facial recognition, as well as conducting demographic pattern analysis. Artificial intelligence enhances multimedia analysis for intricate tasks, including independent facial recognition in complex scenarios. It possesses capabilities to match faces, identify weapons, compare voices, and detect complex events such as accidents or crimes through audio analysis and speech recognition.

viii. **Psychological Analysis in Forensics-** Likewise, artificial intelligence finds effective application in narco-analysis and brain imaging procedures. Through the analysis of brain activity using artificial neural networks, efforts are made to distinguish between deceptive behavior and genuine responses. These networks can provide guidance on the appropriate drug and dosage to administer to suspects, facilitating the disclosure of truth. In the realm of criminal investigations, there exists a variety of individuals who prove challenging to extract the truth from. Artificial intelligence employs lie-detection systems powered by artificial neural networks to elicit the truth from such individuals. This system induces high levels of stress on the person being interrogated, making any attempt at deception detectable. Through the utilization of artificial neural networks, lies can be identified even in highly stressful situations.

ix. **Determining Post-Mortem Interval (PMI)-** From a forensic perspective, conducting a post-mortem examination of a deceased individual is crucial to uncovering various hidden details surrounding their death. This examination sheds light on the duration

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between the individual's demise and the discovery of their body. The post-mortem report compiled by medical authorities serves as evidence in judicial proceedings, regardless of whether it supports or refutes the claims made by suspects or witnesses. During post-mortem procedures, blood samples obtained from the femoral vein are subjected to analysis using a device equipped with an artificial intelligence algorithm. This analysis focuses on determining levels of Lactate Dehydrogenase (LDH), Aminotransferase (AST), triglycerides, and cholesterol, excluding glucose. Estimating the post-mortem interval (PMI) requires interpreting this data in conjunction with the blood's pH level and cross-referencing various databases. The forensic report resulting from this examination must be comprehensive and detailed to enable identification of the cause of death.

x. **Dental Forensics-** Artificial intelligence possesses the capability to discern an individual's identity based on the unique characteristics of their dental structure, including shape, size, and composition. This feature proves invaluable in personal identification, particularly during mass disaster investigations where dental findings play a crucial role. Neural networks are trained to analyze skeletal remains for this purpose, offering precision and efficiency while mitigating potential human biases in estimating skeletal features. Forensic anthropology is the discipline specializing in this aspect of forensic science.

xi. **Cyber Forensics-** In today's digital age, cybercrimes are rampant, perpetrated by nefarious individuals exploiting internet networks for illegal activities such as unauthorized web browsing and facilitating high volumes of online traffic through servers to commit crimes. Artificial neural networks play a crucial role in addressing this issue by tracing perpetrators through methods such as phone call analysis or utilizing pattern recognition systems with remote sensing and satellite technologies.

xii. **Analysis of Forensic Data-** Just like any other dataset, forensic data holds significant importance for analytical examination and deriving crucial observations and conclusions. Forensic experts rely on meticulously analyzed data that is closely linked to the evidence in an investigation. Data itself serves as vital evidence in numerous cases, aiding in the establishment of factual details. To ensure its security from malicious actors, artificial intelligence primarily utilizes digital data that is not easily deciphered. Artificial intelligence extensively employs meta-analysis of metadata gathered from various sources and repositories.

xiii. **Synthetic Smell Detection-** Artificial intelligence is spearheading the development

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of innovative devices and machinery aimed at detecting and characterizing scents emitted from diverse sources, particularly for forensic purposes. Leveraging aroma sensor technology and biochemistry, these devices, also known as electronic noses, are designed to mimic mammalian olfactory systems. They are utilized for identifying and categorizing aroma blends, aiding investigators in detecting various exclusive materials, biological substances, and chemical weapons**.**

xiv. **Analysis of Bloodstain Patterns-** Artificial intelligence proves beneficial in bloodstain pattern analysis conducted by forensic investigators. It aids in examining the size, shape, and distribution of bloodstains resulting from violent events, facilitating determination of the type of activity and modus operandi employed in the crime. The string method is employed to ascertain the origin point of the bloodstains. Utilizing image processing and computer vision, forensic investigators can classify bloodstains using heuristic classification methods. The string method, employed within bloodstain pattern analysis, expedites the resolution of complex cases.

xv. **Prediction of Criminal Activities -** Although crime forecasting presents a complex challenge, as predictions may not always materialize and efforts by law enforcement and security agencies could prove ineffective, the advent of artificial intelligence offers promising solutions. Through the adoption of advanced techniques, artificial intelligence enables nearly accurate crime forecasting, empowering law enforcement agencies to identify criminals and anticipate individuals at risk of criminal activities. Artificial intelligence innovations empower forensic experts to predict and preempt criminal activities, thereby preventing their occurrence. Law enforcement and security personnel leverage artificial intelligence technologies not only for crime detection but also for prediction and prevention. They analyze established crime patterns, monitor suspicious individuals, conduct site visits, and assess risk factors to uncover criminal networks. Additionally, they scrutinize the spread of crime, crime locations, and criminal weaponry, utilizing crime data, facial recognition, and behavioral tracking to identify and apprehend offenders.

xvi. **Offering Legal Remedies-** High-profile criminal cases are typically referred to courts to determine the cause of the crime and identify the perpetrator. Prosecution and defense engage in a legal battle, with the prosecution striving to establish the cause of the crime and the individuals involved. In addition to traditional methods, contemporary artificial intelligence technologies are aiding the legal community by providing efficient solutions to their challenges. Lawyers now have access to various

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devices equipped with statistical tools, enabling them to swiftly gather comprehensive knowledge and obtain prompt answers during trial proceedings. Furthermore, artificial intelligence facilitates rapid communication among forensic statisticians, lawyers, criminal investigators, and medical professionals, ensuring seamless coordination. It effectively bridges any communication gaps that may arise, thereby minimizing the risk of delays or inaccuracies in the delivery of justice.

xvii. **Genetic Analysis**- Forensic laboratories commonly conduct DNA testing or examination of biological substances such as blood, saliva, semen, and skin cells to ascertain the identity of perpetrators, determine the cause of crimes, and identify the weapons, chemicals, or other materials involved in criminal activities, all of which are presented in court. Nowadays, artificial intelligence aids forensic experts in DNA analysis by offering cutting-edge scientific and technical methodologies, crime-related data, and various findings from criminal cases. This assistance enhances the accuracy of data analysis and brings it closer to the factual details of each case. Furthermore, artificial intelligence technology has the capacity to assist in even the most complex analysis scenarios.

SUGGESTIONS

The above discourse underscores the significance of artificial intelligence in forensic science, especially in crime management and prevention, a significance that continues to grow over time. However, similar to human intelligence, artificial intelligence necessitates the development of more sophisticated methodologies and the introduction of advanced technologies to effectively confront the challenges posed by highly technical individuals engaged in criminal, fraudulent, or other antisocial and antinational activities. In this regard, the following recommendations are proposed to enhance the framework of artificial intelligence:

i. Given the rise of new forms of cybercrimes infringing upon public rights, there is a need to broaden the utilization of artificial intelligence systems in our daily lives. We require an artificial intelligence system capable not only of apprehending and penalizing criminals but also of deterring them from engaging in such activities.

ii. The application of artificial intelligence is a highly technical endeavor that demands strategic approaches and state-of-the-art methodologies. Individuals involved in the implementation of artificial intelligence must undergo comprehensive training in technical knowledge to maximize the benefits of artificial intelligence.

iii. The adoption of artificial intelligence technology presents new opportunities for

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forensic investigators and other stakeholders in crime investigation. It is evident that new technology should be developed specifically to implement artificial intelligence, which could be used for the partial algorithmization of the entire criminal proceedings at pre-trial and trial stages.

iv. Currently, artificial intelligence technology is being deployed worldwide to address crime investigation. Some countries, such as Britain and Japan, have achieved high levels of technology in this field. Therefore, countries like India need to develop their technology in line with developed nations to gain expertise in crime management and reduction.

v. It has been observed that the error rate in manual crime investigation handling is relatively high, whereas the use of artificial intelligence eliminates such possibilities entirely. Therefore, it is in the interest of justice to promote the widespread use of artificial intelligence. In many cases, human errors have resulted in perpetrators escaping punishment or evading justice.

CONCLUSION

Undoubtedly, artificial intelligence has emerged as a recent development, yet it is rapidly expanding its influence across various domains of forensic science and crime investigation with notable success. Forensic experts affirm that artificial intelligence has become an indispensable necessity in the current scenario. The software continually undergoes enhancements to provide optimal services. Acting like a repository of information and outcomes, artificial intelligence exhibits multifaceted applicability and holds significant potential in criminal investigation. It greatly aids police investigators and security personnel, facilitating expedited examination and investigation processes. Through artificial intelligence, criminal cases are efficiently resolved, contributing to a reduction in the backlog of legal cases in courts. Presently, many scientists and researchers rely on the sophisticated techniques offered by artificial intelligence. The integration of artificial intelligence has fortified our security and defense systems, ensuring transparency throughout the entire process. Forensic experts are now able to conduct investigations promptly and with improved precision, mitigating the possibility of miscarriages of justice. Consequently, artificial intelligence stands poised to deliver documented and nuanced solutions in the realm of forensic science, with its utility expected to expand into various other fields in the foreseeable future.