

Role of Artificial Intelligence in Forensics

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Abstract: *Artificial Intelligence (AI) is a critical domain within software engineering, focusing on computer processes capable of emulating human behaviors and cognitive processes such as learning, reasoning, adaptation and self-correction. Concurrently forensic science applies scientific methodologies to criminal investigations, specifically concentrating on analyzing evidence within criminal cases. The conventional methods of conducting autopsies and forming opinions exhibit numerous limitations, many of which can be effectively addressed through AI integration. Digital forensics stands out as one of the most rapidly advancing technologies, profoundly influencing the techniques and tools employed for analyzing, monitoring and visualizing crime scenes to mitigate emerging threats and cyber-attacks. Moreover, the realm encompasses forensic medicine, which applies medical expertise to administer justice in Legal proceedings, thereby resolving associate legal complexities. Leveraging the capabilities of AI enables the swift and through sorting of files without manual intervention, significantly expediting investigative processes. Furthermore, AI plays a pivotal role in the identification of mutilated bodies, facilitating the development of tools to reconstruct full facial features. AI generated images can provide remarkable resemblances, aiding in accurately depicting facial features to aid identification efforts. Integrating AI into forensic practices enhances efficiency, accuracy and overall effectiveness in resolving criminal cases.*

Keywords: Artificial Intelligence, Evidence, Criminal Cases, Autopsy, Digital Forensic, Legal Solution

I. INTRODUCTION

AI has become a new cornerstone for all digital transformation initiatives. In last few years, as we know a rise in the adoption of AI in multiple fields, which is also including healthcare systems. Also we can consider AI as a machine acting smart like us. AI is a system ability to correctly interpret external data, to learn from such type of data and to use those learning to achieve specific goals and tasks through flexible adaptation.

Forensic Science

The application of scientific methods and techniques to matters under investigation by a court of law. The term "Forensic" has come from the Latin word "Forensis", and is related to "forum" which means a meeting place in ancient Rome, where dispute used to be discussed relating matter of evidence and testimony in court of law or government proceedings.⁽¹⁾

Application of AI in Digital Forensics

Within the field of digital forensics, it is easy to see the many uses of AI can have. By generating the report and finishing a case study rapidly, security teams can better decide how to protect their systems on a shorter timeline than ever before. AI can also rapidly analyze enormous amounts of data in a significantly shorter time than any human investigator.

Criminal Investigation

During an investigation, AI can assist forensicspecialists in properly managing data and meta-analysis at multiple levels. This may save forensic investigators a significant amount of time to focus on other vital duties.

Legal Solutions

What does all this mean for “Medico-Legal “advisors? The primary areas where AI is being applied in the law, so far, include the following broad categories:

- Review of documents for discoverable.
- Legal research through automated searches of a universe of case law and statutes.
- Contract and legal document analysis.
- Proofreading, error correction and document organization.

AI improves client relations. Building from the previous points.

Face Reconstruction

AI plays a role in the identification of mutilated bodies. AI generated images can provide remarkable resemblances, aiding in accurately depicting facial features to aid identification efforts.

Medico Legal Autopsy

Various procedures of forensic medicine like analysis of toxins, collection of various samples of medico legal importance also the traditional way of doing an autopsy and framing an opinion has a lot of limitations and these limitations can be overcome with AI.

Apart from the above, AI plays various roles in following observations.

AI assisting us in a huge way -

- Evidence collection and analysis.
- Object recognition.
- Facial recognition and suspect identification.
- Digital evidence analysis.
- Pattern recognition and data analysis.
- Time since death examination.
- Forensic imaging and blood stain pattern analysis.

AIM OF THE STUDY

To understand the role of AI (Artificial Intelligence) in forensics.

MATERIALS AND METHODS

Place Of Work – Regional Forensic Science Laboratory Pune

The material for the study were collected from Regional Forensic Science Laboratory Pune (RFSL).

Data was collected from RFSL as per their confidential manner.

Various research papers and articles regarding AI and Forensic.

II. REVIEW OF LITERATURE

The earliest significant study of AI began in the mid-20th century by Alan Turing, a British mathematician, Considered one of the founders of computer science and artificial intelligence, was the first to introduce the ultimate goal and vision of artificial intelligence.

While past few years earlier in year 2004, there was huge range of support available by AI for example, in crime analysis, crime pattern analysis, investigative analysis, network analysis, telephone record analysis, and bank record analysis.

As forensics science deals with examination of victims, accused persons, complainants, defendants, respondents and different exhibits, by a medical man in relation to some criminal or civil cases⁽²⁾

In case of medico legal autopsies, from the period concerned with ancient review as to find cause of death and help dispensation of justice, if any crime is involved in the circumstances of death. Forensics science from that point of view particularly known for the delivery of justice.⁽³⁾

III. RESULTS

From January 2022, AI has been increasingly applied in forensic science, offering promising results in various areas. (Possible uses of AI in forensics)

What will be the future investigations with the help of AI in forensics?

Crime Prediction	AI can analyse complex pattern in crime data, helping law enforcement agencies, to allocate resource effectively and prevent activities.
Digital Forensics	In cases of cyber- crime or digital fraud, AI tools assist in extracting and analyse digital evidence from various devices.
Legal Data Analysis :	AI can analyse documents. History of legal terms especially in medico legal cases where all the medical law get compressed in one of the AI tool and which will be helpful for court to pretend verdict respectively.
Facial Recognition :	AI have been develop to analyse facial features from images and videos adding in suspect identification. For example mutilated body
Post Mortem Examination	In some cases like drowning we can conclude the type of water, diatoms test, chemical patterns of solvents and other contents involves in water. If state of water is unknown, it can be enhance efficiency, accuracy, and potential method.
Voice Analysis	AI can help us to identification, detecting emotions and even identify potential linguistic.
Fingerprint Analysis	Helping to link suspects to crime scenes. Match fingerprints more quickly and accurately.
DNA Analysis	DNA data more effectively, aiding in identifying suspects, victims in criminal cases.
Crime Link Analysis	AI can analyze connections between different pieces of evidence, suspect, criminal activities.

AI in criminal activities could help to investigate suspect and evidence. For As per the data some cases are proven by using example;

Delhi Murder Mystery: How AI helped police solve a blind case

The police created an AI-generated picture of the face of the deceased man with his eyes open and uploaded it on (Crime and Criminal Tracking Network) CCTN website.⁽⁴⁾

AI's Role in Solving Cold Cases: Accurate Identification of Matching Fingerprints in Databases, according to Columbia University⁽⁵⁾

Cops use AI to open man's eyes, crack murder case in Delhi

A 30-member team used AI to identify the body.⁽⁶⁾

Furthermore, according to this kind of searches regarding application of AI in forensic science we can rapidly solve the criminal cases. And also concludes and compare about the data which is pending in a court room as per the proceedings.

IV. DISCUSSION

Understanding the impact of AI in forensics is more on prominent fields like crime scene analysis, facial recognition, legal records maintaining, evidence analysis, medico legal autopsies.

Experimental Application of AI in Forensics

Artificial Intelligence can be used to analyse digital devices and data to uncover hidden evidence and track criminal activity. (7)

Future of AI in Forensic

Respectively it can be used in courts by practitioners, and forensic experts to emerging technology and understand how it will be utilized by a jury in making decisions.

- Overall, while AI holds great promise for enhancing forensic investigations, it is essential to approach its implementation.
- There is need for clear regulations and guidelines governing the use of AI in forensics to ensure or prevent misuses of these technologies.
- Striking a balance between investigation and AI technologies as safeguarding individual privacy right is a significant challenge.
- Ethical use of AI in forensics; one major issue is the potential biased.
- Transparency and Accountability; is important to prevent discrimination and establishing standard ethical criminal justice.

The goal of the guidelines is to encourage a reliable AI system of three components :

AI should be legal or lawful.

AI should be ethical.

V. CONCLUSION

- Forensics is a digital science which is help us in criminal cases for judgements; also with the help of AI is will be update the system for future use.
- Artificial intelligence helps experts handle large and complex data effectively.
- It can be increasing community confidence in law enforcement and the criminal justice system.
- AI will be useful in sorting data especially in pending cases like civil and criminal.
- AI has capability to guide mankind in right direction and help us achieve our goals in an easier and systemic manner.

Integrating AI into forensic practices enhances efficiency, accuracy and overall effectiveness in resolving criminal cases.

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