

## Artificial Intelligence in Forensic Science

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### Abstract

*Artificial intelligence [AI] is a significant and well-established branch of current computer science that may frequently give a way of addressing computationally massive or difficult issues in a reasonable time period. Digital forensics is a growing field in computing that frequently necessitates the cognitive examination of massive volumes of complicated data.*

*As a result, it appears that AI is an appropriate technique for dealing with many of the present difficulties in digital forensics. The goal of this study is to provide a high-level overview of AI as it may be applied in digital forensics.*

**Keywords:** Artificial Intelligence, Artificial Neural Network, Forensics, Data Analysis and Pattern Recognition.

### Introduction

Digital forensics is a new area that needs extensive computing and the processing of huge and complicated data sets. Forensic investigation entails conducting extensive study, gathering information from many sources, and then integrating it in order to reach logical conclusions. While extracting such data from 'mysterious' sources may undoubtedly be a fruitful and intriguing profession, dealing with enormous amounts of data can frequently be confusing and chaotic. In this case, AI provides a useful tool for dealing with and resolving big data sets. [1] During an investigation, AI can assist forensic specialists in properly managing data and doing meta-analysis at multiple levels. This may save forensic investigators a significant amount of time while also ensuring that they have adequate time and motivation to focus on other vital duties!

### Forensic Science

Forensic science is the application of scientific methods or expertise to the investigation of crimes or the examination of evidence that may be submitted in a court of law. From fingerprint and DNA analysis to anthropology and animal forensics, forensic science

### Artificial Intelligence

The replication of human intellectual processes by machines, particularly computer systems, is known as Artificial Intelligence. Expert systems, natural language processing, speech recognition, and machine vision are some of the specific uses of AI.

AI systems function by consuming huge quantities of labelled training data, evaluating the data for correlations and patterns, and then using these patterns to forecast future states. [2] In this manner, a chatbot given text chat examples may learn to generate lifelike conversations with people, or an image recognition pro-

gramme can learn to identify and describe things in photos by analyzing millions of images.

### AI in Criminal Investigation

With fast technological progress in all disciplines, notably in the domains of investigation and forensic science, Artificial Intelligence has effectively made its grand entrance into criminal investigation. Forensic investigation entails conducting extensive study, gathering information from many sources, and then integrating it in order to reach logical conclusions. While extracting such data from 'mysterious' sources may undoubtedly be a fruitful and intriguing profession, dealing with enormous amounts of data can frequently be confusing and chaotic.

During an investigation, AI can assist forensic specialists in properly managing data and doing meta-analysis at multiple levels. This may save forensic investigators a significant amount of time while also ensuring that they have adequate time and motivation to focus on other vital duties!

The acquired data must also be freely available to the parties involved, so that it may be accessed at any moment as needed. AI technology may be used to prepare data repositories so that it can be routinely stored in your systems and accessed as needed.

When it comes to criminal investigations, AI can be a great tool in many respects like -

- a) Data analysis and availability to support the investigation.
- b) Addressing well-scoped problems and methodology for cases.
- c) Pattern recognition.
- d) Explaining the reasoning process well.

- e) Reducing the level of false-positive or false negatives during analysis is very common in forensic science.
- f) Formally structuring the representation of knowledge which will also help the legal community in fast and accurate solution.
- g) Having a well-organized performance evaluation.
- h) Data mining and knowledge discoveries.
- i) Building statistical evidence.
- j) Integrating with current architecture, tools, and applications.

### AI can help in Recognizing Patterns

As an investigator, you must be able to spot subtle connections in order to link and to complete the picture. However, patterns may be quite particular and complicated at times, making them difficult to follow. This is why investigators frequently rely on contemporary technology to identify such trends.

AI technology can assist in pattern recognition, such as identifying different components of a single image, detecting patterns in emails and messages, and matching new information with various forms of existing data in system databases [3]. It can also assist detectives in connecting suspect information with existing criminal records and informing them of any past criminal conduct that the suspect in question may have been involved in.

### Providing Legal Solutions

Forensic statistics offers scientific ways for dealing with evidence in the judicial system. With more sophisticated and comprehensive information databases, AI can assist the legal community with quick solutions when needed.

### Improving Communication

Forensic inquiry necessitates communication among forensic statisticians, attorneys, criminal investigators, and other professionals. Miscommunication between these parties might result in incorrect judgments or misinterpretation of data, resulting in delayed or incorrect justice. AI assists in bridging the communication gap between various participants in this sector.

### Statistical Evidence

Strong statistical evidence is used to support the narrative and arguments in forensic science. AI can create graphical frameworks to aid in the creation of scenarios and case studies. It may also be used to create graphical models of circumstances that can be used to establish or refute claims, allowing the law to make better decisions [4].

### Creating Repositories

AI can also assist in the creation of an online repository that would house all digital forensic investigations, data, assets, and findings. With the exponential rate of growth of storage capacity, such as USB, hard drives, optical media, and flash drives, it is getting more difficult for forensic science investigators to store and evaluate all of this data. AI has the potential to be a good tool to store, analyze and use this data for legal purposes [5].

### Advantages of AI in Forencis

In a forensic investigation, combining people and AI can offer a firm an advantage:

- i. It implements automation, which saves substantial time and money while allowing investigators to focus more on areas where fraud may occur.
- ii. It assists businesses with detecting illegal behavior from massive volumes of unstructured data, such as videos, pictures, emails, and text files.
- iii. It's a more dynamic method than rule-based testing, which can only assess fraud risk across a single data set.
- iv. It eliminates information silos that might hamper an analytics-aided investigation: this occurs when locally-tailored processes prohibit integrated data exchange, creating hurdles to an inquiry [6].

### Conclusion

Artificial intelligence is quickly becoming the most important applied science in all areas of life. Similarly, the forensic sector is benefiting from it, as long as our system does not become entirely dependent on it. More and more individuals are realizing the importance of AI in everyone's lives and working hard to comprehend it through digital science, which is now in everyone's pocket. Technology can make their job easier, but it will never be able to replace them. Because forensic science is an area of specialists, and AI will never be able to reach that level, it will only serve as a supplementary tool.

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