

E61 Artificial Intelligence for Homicide Investigations

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Learning Overview: The goal of this presentation is to introduce a different approach to performing a forensic investigation that could be assisted by data technology and Artificial Intelligence (AI) and to demonstrate the capacity of these emerging technologies and how they may benefit our daily work.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by utilizing and developing the necessary data technologies to increase the accuracy and efficiency in forensic investigation.

AI is the simulation of human intelligence performed by the computer system.¹ AI research is becoming more and more popular in many professional fields around the world, including finance, health care, industry, education, transportation, smart city management, and many other fields. Research has indicated that the primary feature of AI, learning and problem solving, could also assist in the criminal investigation as well.² Although there are many data models and prototype AI systems already developed and employed by the law enforcement community, AI is still an emerging technology for forensic investigation fields. This study attempts to evaluate the potential of AI in forensic investigation and to develop an approach that facilitates an effective investigation through the application of AI.

The proposed approach is built on data and algorithms, and this study concentrated on developing the forensic investigation application through available multidimensional data and efficient algorithms. As a part of computer technology, AI has many unique features in addition to characteristics of the contemporary computer system, including high-performance and accuracy in processing, high capacity in data storage, and high scalability and distribution in network.³ This research specifically identified the features of AI technology that may assist in the forensic investigation by its particular advantages, especially machine learning, as the most important aspect of AI technology would provide investigators with the data-driven predictions and decisions learning from previous cases. The different analytical models of AI to increase the certainty and efficiency in forensic investigation will be introduced. The models simulate a human's perception to enhance the data process, which image recognition and natural language process would help homicide investigators retrieve the critical information from large-scale of data within minimal time. The analytical models also provide the investigators with crucial patterns by pattern recognition, anomaly detection, clustering, classification, and regression. The linkage with individual, evidence, time, location, pattern, and fact in a case will be developed; associate related or serial cases; eliminate the irrelevant individual and evidence; present the case information with graphical depiction; identify and profile the possible suspect; and develop many other investigative leads from data mining by examining correlations, associations, and factors.⁴ Two serial homicide cases will be utilized to demonstrate the process of data collection, data integration, the unstructured data transformation, analysis and reasoning, evaluation and verification, and reconstruction through the application of AI. Details of each logic reasoning and specific data model will be explained as well.

Reference(s):

1. Winston, Patrick Henry. *Artificial Intelligence*. Addison-Wesley, 1999.
2. Russell, Stuart J., and Peter Norvig. *Artificial Intelligence: A Modern Approach*. Harlow, Essex: Pearson, 2014.
3. Charniak, Eugene, and Drew McDermott. *Introduction to Artificial Intelligence*. Reading, MA: Addison-Wesley, 1991.
4. Lee, Henry C., Timothy Palmbach, and Marilyn T. Miller. *Henry Lee's Crime Scene Handbook*. Amsterdam: Elsevier/Academic Press, 2007.

Artificial Intelligence, Homicide Investigation, Data Mining