

Chapter 14

Revolutionizing Crime Investigation: The Role of Deep Learning in Forensic Intelligence

Nituja Singh

 <https://orcid.org/0000-0002-4766-1119>

Symbiosis International University, India

Mumtaz Zabeen Khan

Rayat College of Law, India

Balwinder Kaur

Rayat College of Law, India

Ajitabh Mishra

Rayat College of Law, India

ABSTRACT

As law enforcement agencies face increasingly intricate criminal cases, the incorporation of deep learning presents remarkable capabilities in data analysis, pattern recognition, and predictive modeling. This chapter commences by delineating the core principles of deep learning and its unique benefits compared to traditional forensic methods, particularly its proficiency in efficiently processing extensive datasets. The discourse further explores various applications of deep learning within forensic science, such as digital forensics, biometric identification, and crime scene reconstruction. By utilizing convolutional neural networks (CNNs) and other sophisticated algorithms, investigators can improve image analysis, automate the classification of evidence, and enhance the reliability of eyewitness identifications.

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Additionally, the chapter examines the challenges linked to the adoption of these technologies, including concerns regarding data privacy and algorithmic bias.

INTRODUCTION

The field of forensic intelligence has undergone substantial transformation in recent years, propelled by technological advancements and an increasing acknowledgment of its vital importance in contemporary criminal investigations. Forensic intelligence refers to the organized application of forensic science methodologies to collect and analyze data pertinent to criminal cases. This approach not only facilitates the resolution of crimes but also bolsters the overall efficiency of law enforcement agencies. By converting raw forensic data into practical intelligence, investigators are equipped to make informed decisions that hasten case resolutions and enhance public safety (Anderson & Fang, 2024).

Forensic intelligence represents a comprehensive set of methodologies that merge scientific examination with investigative techniques. Fundamentally, it entails the gathering, preservation, and analysis of evidence obtained from crime scenes, which may include tangible items such as DNA, fingerprints, and electronic data. The primary objective is to deliver timely and pertinent information that aids law enforcement in connecting crimes, identifying suspects, and discerning criminal trends. This intelligence-led strategy facilitates a more proactive approach to crime prevention and investigation. The significance of forensic intelligence is rooted in its capacity to amalgamate data from various sources. By establishing an extensive database of forensic evidence, investigators can uncover patterns and relationships among cases that may initially appear unrelated. For instance, preliminary DNA findings can assist in exonerating suspects or associating multiple offenses with a single individual. This functionality not only expedites investigations but also enables law enforcement agencies to utilize their resources more efficiently (Samuel-Okone et al., 2024).

SIGNIFICANCE OF DEEP LEARNING IN CONTEMPORARY INVESTIGATIONS

As criminal activities become more intricate, the demand for sophisticated analytical tools capable of swiftly and accurately processing large volumes of data intensifies. Deep learning, a branch of artificial intelligence (AI), has emerged as a

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