Chapter 6
Ethics, Algorithms, and the Rules of Evidence:
New Era of AI–Driven Forensics

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ABSTRACT

Forensic intelligence, combined with the power of deep learning, has made significant leaps in revolutionizing crime investigation by allowing law enforcement agencies to process complex data, identify patterns, and predict criminal behaviors with efficiency. Traditional forensic methods can be improved through machine learning techniques and the implementation of natural language processing, which alter digital investigations. A few key ways that these two approaches can benefit computer crime and digital forensic investigations include automating the analysis of evidence, enhancing the accuracy of biometrics, and detecting related hacking activities through traditional forensic methods. It supports data-driven policing and improves the speed of case settlements. Yet, concerns including algorithmic bias, data privacy, and legal admissibility of AI-generated evidence underscore the ethical and social implications of these technologies. This chapter will discuss the transformative power of forensic intelligence and deep learning and its applications, ethics, and future.

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1. INTRODUCTION

Crime is no longer as straightforward as it used to be, and the needs of criminal investigators have evolved. Crime evolves, and thus does criminal investigation; the growing importance of forensic intelligence, a field that embodies the use of scientific methods and technologies in crime-scene detection processes; has become central to our understanding of crime prevention, resolution and the social implications of crime. Combined with recent innovations in artificial intelligence, and specifically deep learning, forensic intelligence can create a paradigm shift in methods to reveal evidence, anticipate criminal actions, and accelerate the completion of investigative cases. This introduction discusses the forensic intelligence foundations, functions of deep learning and their collective importance in modern crime investigation.

1.1 Understanding Forensic Intelligence

Forensic intelligence is the disciplined application of forensic data (and its analysis) to investigative and judicial processes. It focusses on producing actionable insights from the evidence, not just listing the findings. Forensic intelligence is a translational field that applies forensic science techniques to agency practices in integrating evidence with investigative strategies to connect the dots between isolated pieces of evidence and larger crime trends. This interdisciplinary work, spanning chemistry, biology, digital forensics, and geospatial analysis enables the work of this field (Chango et al., 2024).

Forensic intelligence is more than the traditional lab reports it includes being able to recognize patterns of criminal behaviour over time and space with intelligence generated to prevent crime and support enforcement in communities. One thing is the use of DNA databases, which has changed a how people is identified as a suspect, the second thing is the new technology in geospatial analysis, which helps to characterize the trends of crime. The analyst considers the connections of data in this approach, which has been increasingly used in solving issues such as organized crime and terrorism (Interpol, 2020).

1.2 The Rise of Deep Learning in Forensic Applications

Artificial intelligence (AI) has emerged as a pillar of innovation across many sectors, including forensic sciences. Particularly, a neural network is a subset of AI deep learning, which mimics human thought processes to teach machines by exposing them to large sets of data and allowing them to complete complex functions like image identification, pattern detection and human language comprehension. Its application within the forensic context has been paradigm-shifting, particularly in