# Chapter 3
# Bridging Forensic Science, Legal Standards, and Artificial Intelligence: Navigating Challenges and Innovations

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## ABSTRACT

*The analytical framework outlines the intersection of forensic science, legal standards, and artificial intelligence (AI); the potential of AI as a transformative technology; as well as the challenges it poses when integrated into forensic applications. This technology provides forensic specialists with benefits to speed up processes, enabling more effective investigation efforts. But the use of AI in the law poses serious concerns about dependability, transparency, and fairness. This chapter*

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*delves into the current legal standards surrounding forensic evidence, evaluates the impact of AI-based techniques on these frameworks, and calls for strengthened regulatory responses to uphold the admissibility and integrity of AI-supported forensic evidence in the legal process. By examining case examples and recently observed tendencies, this chapter seeks to offer an effective guide on the potential routes for incorporating artificial intelligence into forensic science at an appropriate balance with legal ideals and individual rights considerations.*

## 1. INTRODUCTION

The modern method of crime investigation relies heavily on forensic science, which acts as a mediator between science and law. It consists of a variety of fields such as DNA analysis, fingerprint analysis, toxicology and digital forensics, which are all focused on delivering objective evidence in order to corroborate or dispute assertions in a court of justice. New generations of forensic science have always proved their reliability over the time. Perhaps the most significant advancement in recent years has been the intersection of artificial intelligence (AI) with forensic science, with the potential to revolutionize evidence analysis and enhance investigative practices. But this integration also prompts essential legal questions about the standards that should apply to the admissibility and reliability of forensic evidence (Zangana & Li, 2025).

The deployment of diverse subsets of AI technology resources that learn, predict, and mimic cognition based on training data are expanding the horizons of forensic science like never before. AI can influence criminal investigation and judicial execution from automating the analysis of large amounts of data, to increasing the precision of predictive modeling. In particular, machine learning algorithms are capable of filtering through vast amounts of forensic data to identify patterns that may not be detectable by human analysts, and AI-based facial recognition systems can expedite the identification of suspects.

The ongoing development of AI technologies makes it imperative to engage in a rigorous examination of their impact on legal thresholds that pertain to the use of forensic evidence. Courts frequently rely on criteria like relevance, accuracy, reliability, and scientific validity in determining whether to admit evidence of any kind, guided by legal precedent. This led to the existing guidelines, but the emergence of AI-driven methodologies disrupted this proven landscape, requiring a revision of the standards. Courts will have to wrestle with questions about the scientific validity of A.I (Prabhakar et al., 2025). tools, whether these systems are biased, whether they are black boxes. Moreover, the use of AI in criminal justice