Editorial

The future of forensic science: Where technology meets justice

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Forensic science is at a critical juncture, where the intersection of advanced technology and the continuing quest for justice has the potential to redefine the way we solve crime and enforce the law. Looking ahead, the discipline is on the verge of revolutionary changes that could increase the accuracy, speed up investigations, and solve long-standing problems—while posing important questions regarding ethics, accessibility, and reliability.

One of the most thrilling factors is integrating artificial intelligence (AI) and machine learning. These technologies already are transforming pattern recognition, from fingerprint and face identification to untangling complex mixtures of DNA. AI systems can sort through enormous datasets—consider digital footprints, video surveillance, Digital Video Recording analysis or genetic codes—quicker and more accurately than human experts working alone. Imagine a future where an AI algorithm not only identifies a suspect's DNA at a crime scene but also predicts the likelihood of contamination or degradation, providing investigators with a confidence score alongside raw results. Such innovations could reduce human error and expedite case resolutions, particularly in backlogged systems.

Researchers are currently investigating "molecular eyewitness" technologies—DNA to build physical characteristics, like eye colour or facial configuration, or even estimate a suspect's age using epigenetic markers. Combined with fast DNA sequencing, which can produce results in hours instead of weeks, these technologies can reheat cold cases and provide closure for families who've waited decades for resolution. The advent of digital forensics is another revolution. As our existence continues to play out online, investigators must decode encrypted devices, cloud data, and cryptocurrency transactions. Quantum computing, while in its early stages, may someday break codes that today are unbreakable, with both possibilities for law enforcement and threats to privacy. At the same time, augmented reality could enable crime scene examiners to reconstruct in 3D what happened, providing juries with an experiential grasp of evidence that testimony and still photographs can't provide.

The same technologies that holds importance for improvement will also raise issues of biased used and abuse causing exploitation. AI systems based on imperfect datasets could reinforce racial or socioeconomic biases, and too much reliance on automation which could undermine the human judgment. Privacy will also be at stake—how much genetic or digital data to collect, store or share? And as forensic tools get ever more sophisticated, their expense may exacerbate the disparity between resources for well-funded agencies and poor ones, even threatening a two-tiered justice system: the crime control model and due process model where on system protects the community and other gives individual Rights.

Where this innovation is a potential advantage, ethics and regulation will be equally significant. To understand the forensic interpretations and results citizens and courts both require knowledge that methods are not merely innovative but also grounded in science with application of technological innovation. The future of forensic science, in other words, is a two-edged sword. It is the seductive promise

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of all-but-infallible truth-seeking—a world where no crime ever goes unsolved for lack of evidence. It requires caution to make sure that advancement does not outrun accountability. At this threshold, where we are now poised, the test will be to use these tools not merely with accuracy, but with conscience, making justice the ultimate objective.

Conflict of Interest

None.