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EVALUATING THE ADMISSIBILITY OF AI EVIDENCE IN CRIMINAL PROCEEDINGS: LEGAL STANDARDS AND ETHICAL IMPLICATIONS

ABSTRACT

This paper explores the role of artificial intelligence (AI) in criminal courts, highlighting its impact on the judicial process as technology evolves. Key issues highlighted in this paper include the reliability of AI evidence, ethical implications, and the potential for bias. The study aims to assess the effectiveness of AI evidence, its influence on the right to a fair trial, and the standards for admissibility in court. This research integrates quantitative case law analysis with a review of existing literature. It identifies the challenges that surface when using AI evidence. The findings contribute to the ongoing discussion about the intersection of technology and law, hinting at practical recommendations for policymakers and legal professionals. Ultimately, this paper seeks to enhance our understanding of AI's role in the criminal justice system.

Keywords: *artificial intelligence, admissibility, AI-generated evidence, deep fake, authenticity.*

1. INTRODUCTION

In recent years, we've seen artificial intelligence (AI) make a huge impact across various industries, and the legal system is no different. One of the most affected areas is the criminal justice system, where AI technologies are now being used to assist with everything from evidence collection to case management and even predictive policing. With courts confronting challenges from modern technology, the introduction of AI in criminal proceedings raises essential questions about its reliability, fairness, and ethical implications. AI systems are being used more and more in criminal justice system, involving everything from algorithms that sift through huge amounts of data in real-time to models that attempt to predict criminal behavior based on past incidents. This growing reliance on technology is pushing existing legal frameworks to adapt, as they were originally built around

human judgment and traditional standards of evidence. In a courtroom, evidence plays a crucial role in influencing the outcome of a case, but not all types of evidence are equally significant. There are various forms of evidence that can be presented, including testimonial, physical, documentary, and demonstrative evidence.¹ Testimonial evidence comes from witnesses or experts, while physical evidence consists of tangible items like weapons or clothing. Documentary evidence includes materials such as contracts or emails, and demonstrative evidence involves visual aids like diagrams or animations. Each category of evidence has a specific role, and comprehending their significance is vital for constructing a persuasive argument. Ultimately, it is the responsibility of the judge and jury to assess the different pieces of evidence and determine which ones carry the most influence.² Evidentiary standards determine the quality and quantity of evidence presented in the courtroom. In criminal cases, where the gravity of potential consequences makes it essential to ensure that legal proceedings are fair and just, upholding these standards is crucial. By releasing AI evidence into courtrooms, many new questions are raised, from the admissibility of such evidence, its reliability and accuracy, and possible abuses and negative consequences for criminal proceedings.

2. AI USED AS EVIDENCE IN CRIMINAL COURTS

Artificial intelligence is not a neutral technical tool; it alters the balance of power and poses risks to fair trials and equality.³ AI evidence is created when AI system generates the output autonomously and by using machine learning.⁴ Experts commonly categorize AI evidence into two distinct types: AI-filtered and AI-generated. AI-filtered evidence refers to information that has been enhanced by AI tools without altering the fundamental outcomes or core data of the dataset. For instance, this could include AI-assisted methods for navigating extensive databases. Conversely, AI-generated evidence involves instances where AI technologies actively modify, refine, or fabricate the evidence itself. The distinction between evidence gathered and evidence produced by AI systems is often considered significant, but some believe it is misguided.⁵ Modern AI

¹ See The Role of Evidence in Proving Criminal Offenses: The Complete Guide, <https://focusconlaw.com/the-role-of-evidence-in-proving-criminal-offenses-the-complete-guide/>, 12 March, 2025.

² *Ibid.*

³ Paraphrased statement by Professor Katalin Ligeti from her lecture on AI Evidence held in Luxembourg on Thursday, 7 November, 2024.

⁴ *Ibid.*

⁵ Galic, M., Das A., Schuilenburg M., *AI systems and evidence law in the Netherlands*, Artificial Intelligence and Administration of Criminal Justice, Apeldoorn: Maklu, 2023, p. 315.

systems, like *Hansken*, not only collect evidence in criminal cases but also generate data.⁶ Crime investigations produce extensive multimodal data, including text, images, videos, and audio. Traditional tools, developed for searching structured textual data, no longer suffice, and new and more complex AI-based systems needed to be developed.⁷ These systems must be able to interpret data on their own (for instance, recognizing images of drugs) and identify relevant correlations among various data points, which can help create a coherent timeline and narrative. This shift illustrates that we are not simply gathering data; we are also dealing with its complex production by these systems.⁸

A Luxembourg based research team led by Professor Ligeti identified three types of AI evidence.⁹ The first type includes evidence gathered using AI tools to handle tasks that are time-consuming or error-prone, such as analyzing large datasets for incriminating emails or flagging harmful content. This evidence can be presented in court in its original form. The second type, termed "AI-generated evidence," includes examples like forensic DNA analysis and enhanced images from surveillance footage, where AI improves the quality of data. This category also extends to data generated by consumer products like smart devices that may be relevant in legal cases. The third type involves AI assisting in the investigative process to generate leads for human analysts, such as using facial recognition for suspect identification. Seng and Mason¹⁰ have similar approach, claiming that evidence generated by AI can be categorized into three distinct groups. The first category includes evidence created using devices that accept human-supplied input and produce output. This type of evidence, which consists of content that has been spoken or written by one or more individuals, is primarily considered hearsay evidence. The second category consists of data produced by self-contained devices that gather input or record information from the environment without any human intervention. This means they are largely automated, and because they are not used as testimony, they are almost never challenged. Such evidence is regarded as real or mechanical evidence, falling outside the hearsay rule due to its lack of human involvement. The third category encompasses a combination of human-supplied input and data processed by systems that operate without human supervision. This makes it a hybrid of the first two categories. Judges play a key role in determining the admissibility of AI-generated evidence. To make informed decisions, they

⁶ *Ibid.* p. 315.

⁷ *Ibid.* p. 315.

⁸ *Ibid.* p. 315.

⁹ See The digital witness: how AI evidence is reshaping criminal justice, <https://www.uni.lu/en/news/the-digital-witness-how-ai-evidence-is-reshaping-criminal-justice/>, 20 February, 2025.

¹⁰ Seng, D., Mason, S., *Artificial Intelligence and Evidence*, Singapore Academy of Law Special Issue on Law and Technology, 2021, p. 259-261.

must understand AI algorithms, training data, fundamental principles, potential biases, and risks like deepfakes.

3. DEEP FAKES

Deep fakes are fake images, video and other media in which a person is replaced with someone resembling them using artificial intelligence techniques. The term is coined from "deep learning" and "fake". They are defined in the EU Artificial Intelligence Act¹¹ as a "deep fake" as an AI-generated or manipulated image, audio or video content that resembles existing persons, objects, places, entities or events and would falsely appear to a person to be authentic or truthful. While initially popularized in entertainment and social media, deepfakes have increasingly become a concern in various sectors, notably in legal contexts. Their role in criminal proceedings poses significant challenges, impacting the integrity of evidence and the broader judicial system. Nowadays, deep fakes are super realistic, and they offer the possibility to create false representations of individuals that may affect their lives greatly. One of the most popular examples was an image of pope Francis in Balenciaga coat, or more recently, fake video of former President of the U.S., Joe Biden, allegedly inviting people to boycott the elections. It is especially dangerous to have such manipulations in courtrooms, as they could potentially mislead judges and result in wrongful convictions or the dismissals of legitimate claims. In criminal cases, this technology could be misused to fabricate evidence, such as video or audio recordings that appear to depict someone committing a crime or making incriminating statements. Deepfakes can appear in legal contexts in several ways, such as being fabricated by a party to influence a case or being unknowingly presented as evidence by a litigant.¹² They can also mistakenly end up in trusted archives, like news outlet collections so if custodians of these records do not recognize a deepfake, they may inadvertently validate its authenticity in court proceedings.¹³ If a deepfake were to be presented as legitimate evidence, it could undermine trust in the judicial system. Defense attorneys may find themselves challenging evidence that looks convincingly authentic, while prosecutors must battle the challenge of proving the authenticity of their evidence. Identifying such content is becoming more and more difficult for experts as AI

¹¹ Article 3 of Regulation (EU) 2024/1689 of the European Parliament and of the Council of 13 June 2024 laying down harmonized rules on artificial intelligence and amending Regulations (EC) No 300/2008, (EU) No 167/2013, (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1139 and (EU) 2019/2144 and Directives 2014/90/EU, (EU) 2016/797 and (EU) 2020/1828 (Artificial Intelligence Act).

¹² Pfefferkorn, R., *'Deepfakes' in the Courtroom*, Boston University Public Interest Law Journal, Vol. 29, No. 2, 2020, p. 255.

¹³ *Loc. cit.*

tools are evolving and getting better every day. Very nature of deepfakes complicates the already intricate process of verifying evidence in court. It makes it almost impossible to differentiate authentic from fake evidence. As the expert Karsten Theiner explained, photomontage is nearly as old as photography and AI makes it even harder to detect because everyone can use these tools, they are quick and cheap. It is even considered that AI has advanced so much that it is easier to prove that certain content is authentic than that it is not. This would mean that deep fakes would not be considered as evidence that experts have successfully proven to be a hoax, but only those pieces of evidence that experts are convinced are unmanipulated evidence would be considered authentic. On the positive side, Artificial intelligence can be used to detect deep fakes, and in this way, AI tools in the hands of forensic experts can be helpful. Laws need to catch up with the challenges that deepfakes bring to criminal justice. It is crucial to establish clear rules about when and how deep fake evidence can be used in court. In the interest of finding the truth we should also consider developing and deploying AI tools to help forensic experts identify deep fakes more easily. Collaboration between tech experts, lawyers, and law enforcement is essential to develop effective standards that can adapt to these new challenges.

In April 2024, the UK criminalized sexually explicit deepfakes through the Online Safety Act, imposing unlimited fines and potential jail time for offenders.¹⁴ However, gaps remain in addressing other deepfake crimes, making it challenging for prosecutors to find applicable charges.¹⁵ In the United States, regulations vary by state.¹⁶ California restricts political deepfakes, and Texas prohibits harmful uses, but no federal legislation exists.¹⁷ The EU AI Act, which mandates disclosure of AI-generated content, imposes strict controls on deepfake creation, enhances content traceability, and enforces substantial penalties for violations. However, law enforcement struggles with proving criminal intent, establishing jurisdiction, and keeping pace with rapid technological changes. Under the AI Act there is an obligation for deployers of AI systems generating deep fakes to disclose to individuals that the content has been artificially produced or modified, with exceptions in cases of artistic or creative works where transparency does not hinder enjoyment and AI systems authorized for law enforcement purposes.¹⁸ However, AI Act alone is not sufficient safeguard when it comes to criminal proceedings.

¹⁴ See The Deepfake Crisis: How AI is Reshaping Criminal Justice, <https://www.crimetraveller.org/2025/02/the-deepfake-crisis-ai-criminal-justice/>, 15 March, 2025.

¹⁵ *Ibid.*

¹⁶ *Ibid.*

¹⁷ *Ibid.*

¹⁸ Article 50. of Artificial Intelligence Act, see <https://artificialintelligenceact.eu/article/50/>.

4. LEGAL FRAMEWORK AND STANDARDS FOR ADMISSIBILITY OF CRIMINAL EVIDENCE

Forensic and scientific evidence have really changed the game in the criminal justice system. They play a crucial role in solving crimes, securing convictions, and even helping to exonerate those who are wrongly accused. With the rapid advancements in technology, the legal system is now better equipped to analyze evidence, leading to more accurate and reliable outcomes. Techniques like DNA profiling, fingerprint analysis, toxicology, ballistics, and digital forensics have shifted the focus from relying solely on witness testimony to using solid scientific methods. However, this growing reliance on forensic science doesn't come without its challenges. There are valid concerns about how admissible, reliable, and valid this evidence truly is. Courts face the tough task of balancing the intricate relationship between law and science, making sure that only evidence that meets rigorous standards is allowed in the courtroom, while also being vigilant against the potential misuse of flawed techniques. Ultimately, it is essential that courts ensure that the evidence presented is not only relevant but also reliable. To do this, various legal standards have arisen to help evaluate what can and cannot be accepted in trials. We could argue that evidentiary standards are the backbone of a fair trial in criminal law. They not only protect the rights of the accused but also uphold the integrity of the judicial process. By ensuring that all decisions are based on solid evidence, the legal system aims to strike a balance between the pursuit of justice and the protection of individual rights, which is a cornerstone of democratic societies. There is a need for procedural safeguards to establish in detail the admissibility of AI evidence in criminal courts, and what kind of oversight should we have if we strive to ensure the system with no mistakes. Existing statutes and laws regarding evidence admissibility do not specifically address AI-generated evidence and leave the gaps that need to be filled as soon as possible. This paper focuses mainly on the admissibility of AI evidence in European Union legal area and draws a comparison with the legal solutions in the United States of America. It is important to mention that the U.S. leads in terms of application of AI in the criminal justice system. Although there are many differences between these two mutually opposite legal systems, it could be said that neither is up to this challenge so far. For example, legal protections in Germany (such as access to case files and witness confrontation) and the U.S. (like challenging witnesses and the hearsay rule) are inadequate for ensuring accurate fact-finding when machine-generated evidence is presented as neither system effectively allows for the thorough evaluation or contextualization of such evidence in court.¹⁹

¹⁹ Gless, S., *AI in the Courtroom: A Comparative Analysis of Machine Evidence in Criminal Trials*, Georgetown Journal of International Law, Volume 51, No. 2, 2020, p. 232

4.1. Evidentiary standards in criminal law

One of the best-known standards in criminal law is the "beyond a reasonable doubt" threshold, which the prosecution must meet to secure a conviction. We could think of it as a level of certainty that the prosecution must achieve to convict someone of a crime. The "beyond a reasonable doubt" standard represents the highest level of proof required from a party during a trial, primarily utilized in criminal cases. It mandates that the prosecution must demonstrate that the only reasonable conclusion from the evidence is that the defendant committed the crime in question, leaving no room for any alternative reasonable explanations based on the facts presented. This standard reflects the serious consequences of a criminal conviction, emphasizing that it is better for a guilty person to go free than for an innocent person to be wrongly convicted. In contrast, the defense bears a lower burden, typically only needing to raise reasonable doubt about the prosecution's case. In certain criminal cases, specific standards like *probable cause* and *reasonable doubt* can apply. The probable cause standard refers to credible information that suggests there is a significant likelihood a person has committed a crime or that a search may uncover illegal items or evidence.²⁰ It is used to decide when a police officer can perform a search, make an arrest, or obtain a warrant, and it relies on examining "the totality of the circumstances" in each case. On the other hand, reasonable suspicion is a less strict standard that applies during traffic stops and stop-and-frisk situations. While it is more relaxed than probable cause, an officer must still have more than just a vague feeling to justify stopping someone. On the other hand, "reasonable suspicion" is a firm belief, although it may stem from less reliable or limited information, that a person is engaged in criminal activity or could be armed and pose a threat. The key element is the level of probability required for the law enforcement to justify taking specific actions. However, to conclude criminal proceedings, it is essential that there is no longer any doubt regarding both the perpetrator and the crucial elements of the case.

4.2. Admissibility of AI evidence in the U.S.

In the United States, the Federal Rules of Evidence²¹ dictate the standards for what evidence can be presented in federal courts. A key principle is that evidence must

²⁰ See Probable Cause and Reasonable Suspicion, <https://www.policemag.com/patrol/article/15348208/probable-cause-and-reasonable-suspicion>, 15 March, 2025

²¹ The Federal Rules of Evidence govern the admission or exclusion of evidence in most proceedings in the United States courts. These rules were first adopted in 1975 and codify the evidence law that applies in U.S. federal courts. They cover various aspects of evidence, including relevance, privileges, witnesses, expert testimony, and hearsay. See

be relevant, meaning it must make a fact more or less likely than it would be without it (Rule 401).²² However, relevance alone does not guarantee admissibility; courts also consider whether the evidence's probative value outweighs its potential prejudicial impact (Rule 403).²³ This balance helps ensure that juries are not swayed by emotionally charged evidence that may not pertain directly to the case. Another important aspect is hearsay, defined under Rule 801²⁴ as an out-of-court statement used to prove the truth of the matter asserted, which is generally inadmissible due to reliance on the original speaker's credibility. However, there are exceptions, such as business records and statements made under the fear of imminent death, where certain hearsay can be accepted. Additionally, evidence obtained through illegal means, such as violations of the Fourth Amendment rights against unreasonable search and seizure, is usually excluded to maintain a fair judicial process. Expert testimony is addressed in Rule 702,²⁵ allowing specialists to give opinions based on their expertise, provided the testimony is relevant and reliable.

4.2.1. Landmark U.S. cases and standards

The landmark case, *Daubert v. Merrell Dow Pharmaceuticals, Inc.*,²⁶ established criteria for judges to determine the admissibility of such testimony, ensuring that only scientifically valid information is presented. It allows judges to act as "gatekeepers" in determining the relevance and reliability of expert testimony. Factors considered include peer review, known error rates, and sound methodology. Judges often get swayed by credentials of these experts and do not question reliability. However, it is unknown what the error rate of these experts is.

The *Frye* standard, established in *Frye v. United States*,²⁷ is used to evaluate the admissibility of expert scientific testimony and other evidence. It aims to limit admissible evidence to that which is deemed reliable by the broader field, ensuring that new methods receive general recognition before being utilized in court.²⁸ When this standard applies to physical evidence, courts must ascertain if the

<https://www.uscourts.gov/forms-rules/current-rules-practice-procedure/federal-rules-evidence>

²²

See

<https://uscode.house.gov/view.xhtml?path=/prelim@title28/title28a/node230/article4&edition=prelim>, 21 March, 2025.

²³ *Ibid.*

²⁴ See <https://www.rulesofevidence.org/fre/article-viii/rule-801/>, 21 March, 2025.

²⁵ See https://www.law.cornell.edu/rules/fre/rule_702, 21 March, 2025.

²⁶ See <https://supreme.justia.com/cases/federal/us/509/579/>, 21 March, 2025.

²⁷ See <https://casetext.com/case/frye-v-united-states-7>, 21 March, 2025.

²⁸ See *Frye Standard*, https://www.law.cornell.edu/wex/frye_standard, 21 March, 2025.

method of obtaining that evidence is broadly accepted by experts in the specific domain.²⁹ Similarly, for expert testimony, it requires a court to ensure the methodologies used by the expert align with the accepted practices of peers in that field.³⁰ While useful, this standard has been criticized for being too rigid and excluding emerging techniques. Despite that, is still used in some states, but many have shifted to the Daubert Standard that considers factors like testing and peer review.³¹

The Washington State Superior Court ruled against admitting AI-enhanced video evidence in the State of Washington v. Puloka case.³² The court first acknowledged that the usage of AI tools for video enhancement in a criminal trial was a novel technique, placing the onus on the defendant to demonstrate that the method was accepted within the relevant community. It was determined that the relevant scientific community was the “forensic video analysis community.” The forensic video analysis community did not recognize it as a dependable source of evidence despite the pleas of the defense team to introduce an AI-enhanced version of a smartphone recording, claiming the original footage had low resolution, significant motion blur, and unclear images.³³ When considering whether to accept the video as evidence, the court heard evidence that the AI tool modified and added content to the original video, and while the enhancements improved its appeal to viewers, the integrity of the images was compromised. According to the judgement, the AI modifications altered the original video significantly, leading to the court requiring compliance with the Frye test, which the defense could not satisfy.

Specifically, the court stated that the Topaz Video AI enhancement tools, which implement machine-learning algorithms, have not undergone peer review by the forensic video analysis community, cannot be replicated by that community, and are not generally accepted among its members. Furthermore, the court pointed out that the defense had not presented any state or federal appellate rulings that had analyzed or sanctioned AI-enhanced videos in either criminal or civil trials. Additionally, the court observed that the defense did not provide any articles, publications, or secondary legal sources endorsing the introduction of AI-enhanced video evidence in such trials. It also highlighted that the defendant’s expert admitted to not knowing the videos upon which the AI model was trained,

²⁹ *Ibid.*

³⁰ *Ibid.*

³¹ *Ibid.*

³² See AI on trial: How courts are litigating the GenAI boom, https://fingfx.thomsonreuters.com/gfx/legaldocs/zgvokxekavd/04192024ai_wash.pdf, 21 March, 2025.

³³ *Ibid.*

was uncertain if generative AI was used in their algorithms and agreed that such algorithms were “opaque and proprietary.” The court also concluded that AI-enhanced video did not meet the criteria outlined in Washington Rule of Evidence (ER) 702,³⁴ which states that evidence may only be permissible if it is reliable and assists the jury, as well as ER 403,³⁵ which specifies that evidence is inadmissible if its probative value is significantly outweighed by the risk of unfair prejudice. The court found that the AI-enhanced video did not accurately depict what had occurred but rather employed unclear methods to showcase what the AI model believed should be displayed, indicating a substantial risk of a lengthy trial to resolve questions about the non-peer-reviewed processes used by the AI model. While we can't say that other courts will come to the same conclusion, it does show where the debate over the admissibility of AI-generated evidence in U.S. courtrooms might go.

4.3. Admissibility of AI evidence in the EU

At the level of the European Union, there is no special unified test of admissibility of evidence, but it is left to the national jurisdictions of the Member States and therefore varies from country to country which evidence is considered admissible, and which is not. Most EU countries have very soft approaches and therefore some argue that the European countries, unlike the U.S., follow the principle of freedom of evidence,³⁶ where the courts can decide on any piece of evidence that the parties present before them and they are the ones who have discretion in deciding on the admissibility and authenticity of individual evidence. Other experts, however, argue that Europe (EU Member States) exhibits a dual approach where some legal systems rigorously evaluate which information can be presented in court (known as “controlled systems”), while others allow judges the discretion to decide if they should ignore evidence that was obtained illegally (“free proof systems”).³⁷

³⁴ See Washington Rules of Evidence 702, <https://casetext.com/rule/washington-court-rules/washington-rules-of-evidence/title-7-opinions-and-expert-testimony/rule-er-702-testimony-by-experts>, 21 March, 2025.

³⁵ See Washington Rules of Evidence 403, <https://casetext.com/rule/washington-court-rules/washington-rules-of-evidence/title-4-relevancy-and-its-limits/rule-er-403-exclusion-of-relevant-evidence-on-grounds-of-prejudice-confusion-or-waste-of-time>, 21 March, 2025.

³⁶ Champod, C., Vuille, J., *Scientific Evidence in Europe -- Admissibility, Evaluation and Equality of Arms*, International Commentary on Evidence, Volume 9, No. 1, 2011, p. 32.

³⁷ Garamvölgyi, B., Ligeti, K., Ondrejová, A., von Galen, M., *Admissibility of Evidence in Criminal Proceedings in the EU*, EUCRIM, Focus: The Future of EU Criminal Justice – Expert Perspectives, Issue 3, 2020.

Given the fact that AI evidence is in fact electronic evidence, it is important to mention that, to address many challenges of implementing electronic evidence in criminal trials, the European Union took a significant step by implementing a new legal framework designed to handle electronic evidence in criminal cases. In June 2023, the European Parliament and the Council of the EU adopted two legal instruments – a regulation and a directive – concerning electronic evidence in criminal cases.³⁸ This framework, known as the EU Electronic Evidence legislative package,³⁹ aims to set clear guidelines for how electronic evidence such as social media interactions, online communications, and AI-processed surveillance footage should be collected, analyzed, and presented in court. Throughout the legislative process, these two acts faced widespread, frequently critical feedback from data protection authorities, civil society, and industry stakeholders. The new provisions will enable law enforcement and judicial authorities to directly request (or temporarily secure) electronic data necessary for crime investigation and prosecution from electronic service providers operating within the EU, regardless of where the data is stored. Furthermore, they will require these service providers to designate a legal representative responsible for collecting evidence and responding to requests from competent authorities. These two legal acts are part of a broader set of international initiatives aimed at enhancing the legal framework and addressing ongoing legal ambiguities that impact both law enforcement and private entities. Certainly, in the EU, the emphasis is currently more on access to electronic evidence and on creating a kind of cooperation between Member States through possibilities of sharing and retrieving evidence from one country in another and assessing evidence that originates from another country rather than setting certain unified rules for the admissibility of evidence.

4.3.1. The Marengo case

Use of AI algorithms is admissible by the current Dutch Criminal Code Procedure, but a judge is the one who decides on the reliability of evidence collected and obtained via these algorithms.⁴⁰ The Marengo trial, involving alleged leaders of

³⁸ See Electronic evidence in criminal matters, [https://www.europarl.europa.eu/RegData/etudes/BRIE/2021/690522/EPRS_BRI\(2021\)690522_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/BRIE/2021/690522/EPRS_BRI(2021)690522_EN.pdf), 15 February, 2025.

³⁹ See The EU Electronic Evidence Legislative Package, <https://www.eurojust.europa.eu/publication/eu-electronic-evidence-legislative-package>, 1 March, 2025.

⁴⁰ Paraphrased parts of presentation by Professor Rick Robroek from his lecture on Algorithmic Criminal Procedure in the Netherlands held in Luxembourg on Thursday, 7 November 2024, See Algorithmic criminal procedure,

the Mocro Maffia, is a legal case against seventeen defendants accused of multiple murders and attempted murders.⁴¹ It concluded on February 27, 2024, after six years, with three individuals receiving life sentences for their involvement in ten murders. The Supreme court addressed the defense's claim regarding a violation of fair trial rights under Article 6 ECHR, emphasizing that the defense did not have adequate opportunities to review and contest evidence obtained through Hansken⁴² due to lack of access to its source data and software. Defense claimed that use of Hansken was not regulated, prohibiting counter-expertise, and claimed that it was an unlawful technical aid. Despite the defense's concerns about the reliability of data, the court highlighted that they could have requested targeted searches of the source data but failed to do so. The Court pointed out that only 10% of the Marengo dataset consisted of suspect communications, with the rest being from third parties. The court acknowledged the risk of relying on algorithmic analysis of bulk data but asserted that Hansken is used merely for viewing already obtained evidence and cannot be used in isolation without corroborating evidence.

4.3.2. European courts on admissibility of evidence

The European Court of Human Rights (ECtHR) has determined that national law governs the admissibility of criminal evidence.⁴³ Nevertheless, for the proceedings to be fair, all evidence should generally be presented in the presence of the accused at a public hearing, allowing for challenge in an adversarial context. The Court will pay attention to the evidence rules in a specific State or how they are implemented if they might impact the overall fairness of the proceedings and thereby infringe upon the right to a fair trial as outlined in Article 6(1) of the European Convention on Human Rights (ECHR).⁴⁴ While hearsay evidence is not inherently against Article 6(1) of the ECHR, unlawfully obtained evidence is also not automatically excluded. Instead, the impact of how the evidence was gathered

<https://aiandcriminaljustice.uni.lu/wp-content/uploads/sites/260/2024/11/RICK-Algorithmic-criminal-procedure-CRIMAI-071124.pdf>.

⁴¹ See Criminal case Marengo, <https://www.rechtspraak.nl/Bekende-rechtszaken/Marengo#c6d1aeeec-f4b1-4619-809a-fc6a359acdc84a7cf171-58c6-4eaa-8012-5ee85c3b5c301>, 1 March, 2025.

⁴² Hansken is the open digital forensic platform designed to give access to and insight in digital data and traces originating from seized and demanded material. Since 2012, the Netherlands Forensic Institute (NFI) has been developing a prototype to provide Digital Forensics as a Service (DFaaS). In recent years, parts of this platform have applied at the Dutch National Police and the Dutch Fiscal Information and Investigation Service, amongst others. <https://www.hansken.nl/an-introduction-to-hansken>.

⁴³ See *Hümmer v Germany* judgement, App No 29881/07, ECtHR, 19 July 2012, p. 10.

⁴⁴ Art. 6. of the Convention for the Protection of Human Rights and Fundamental Freedoms, Official Gazette - International Conventions, No. 18/1997, 6/1999, 14/2002, 13/2003, 9/2005, 1/2006, 2/2010, 13 /2017 (hereinafter: ECHR).

is assessed to determine the overall fairness of the trial. Factors that the ECtHR considers when evaluating the fairness of a trial involving unlawfully obtained evidence include the nature of unlawfulness, whether it violates a Convention article other than Article 6, and the specifics of the violation. The burden of proving an accused person's guilt rests with the prosecution. As such, any presumptions regarding evidence must be contestable, and it should not be permissible to make deductions based on the accused's lack of cooperation unless the circumstances warranting their presence clearly demand an explanation. Additionally, acquiring material from a suspect that exists independently of their consent should not involve methods that violate Article 3 of the European Convention.⁴⁵ The ECtHR does not specify a particular standard of proof required for prosecution in criminal cases, though it recognizes that this standard is typically higher than in civil cases. Evidence obtained illegally does not automatically cause the proceedings to be deemed unfair. The Court assesses whether the rights of the defense have been upheld and evaluates the strength of the evidence, especially if its authenticity is clear. However, any use of unlawful methods to gather evidence is condemned.⁴⁶

The Court of Justice of the European Union (CJEU) has limited case law regarding evidentiary remedies. Recently, it proposed that the exclusionary rule should apply to evidence obtained in violation of EU law under two conditions: first, when the accused cannot effectively respond to the evidence, and second, when the evidence involves topics outside the judges' expertise that could significantly influence factual conclusions.⁴⁷ However, the CJEU has not provided detailed explanations on how these criteria should be applied or the reasoning behind the necessity for mandatory exclusion of such evidence.

We must conclude that legal systems in Europe, but also around the world are still not ready to deal with the introduction of AI evidence in courtrooms.

⁴⁵ See McBride, J., The Case Law of the European Court of Human Rights on Evidentiary Standards in Criminal Proceedings, European Union – Council of Europe joint project “Application of the European Convention on Human Rights and harmonisation of national legislation and judicial practice in line with European standards in Georgia”, <https://rm.coe.int/council-of-europe-georgia-european-court-of-human-rights-case-study-ev/16807823c3>, 1 March, 2025

⁴⁶ *Loc. cit.*

⁴⁷ Fair Trials Report, Unlawful evidence in Europe's courts: principles, practice and remedies, 2021, <https://www.fairtrials.org/app/uploads/2021/11/DREP-report.pdf>, 25 February, 2025.

5. CHALLENGES AND CONCERNS

The use of artificial intelligence (AI) in criminal courts could dramatically change the way our justice system operates. While there are many potential benefits to integrating this technology, it's essential to carefully consider the challenges it brings. One of the biggest concerns is bias. AI systems learn from historical data, which can carry forward existing inequalities. If the information used to train these algorithms reflects issues like racial or socioeconomic disparities, we run the risk of AI reinforcing these biases. For example, predictive policing tools might unfairly target specific communities, leading to ethical dilemmas about fairness and equality under the law. Transparency is another significant challenge. Many AI systems operate as "black boxes" meaning that their decision-making processes are not clear to us. This lack of understanding means that judges, juries, and lawyers may struggle to evaluate the evidence generated by AI. If we can't see how an AI reached a conclusion, defendants might not fully understand the accusations against them. Furthermore, there's the issue of data privacy and security.⁴⁸ Training AI requires huge amounts of personal data, raising concerns about consent, potential misuse, and the risk of data breaches. Finding a way to protect sensitive information while still using data effectively in AI is a tricky balancing act for the justice system. Even within the European Union, where the General Data Protection Regulation⁴⁹ and the accompanying Law Enforcement Directive⁵⁰ set stringent data protection standards related to criminal offenses and penalties, fully automated decision-making is still permitted, though infrequently.⁵¹ Member States can allow decisions to be made solely through automated processing that negatively impacts the data subject. The only requirement is that such actions must be authorized by Union or Member State law, provided that they include adequate safeguards for the rights and freedoms of the data subject.

⁴⁸ Roksandić, S.; Protrka N.; Engelhart, M., *Trustworthy Artificial Intelligence and its use by Law Enforcement Authorities: where do we stand?*, 45th Jubilee International Convention on Information, Communication and Electronic Technology (MIPRO), Opatija, Croatia, 2022, pp. 1225-1232.

⁴⁹ Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC.

⁵⁰ Directive (EU) 2016/680 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data by competent authorities for the purposes of the prevention, investigation, detection or prosecution of criminal offences or the execution of criminal penalties, and on the free movement of such data, and repealing Council Framework Decision 2008/977/JHA.

⁵¹ Bampasika, E., *Artificial Intelligence as Evidence in Criminal Trial*, CEUR Workshop Proceedings, 2021, p. 133-138.

5.1. Errors and biases in AI algorithms

Since artificial intelligence is not perfect, it is not infallible, many believe that even the evidence resulting from the use of AI is not convincing enough to be legally relevant in a courtroom. With all the many benefits that the use of new technologies brings, the question arises whether we can ignore all the concerns. By now, it is very well known that the output generated by artificial intelligence largely depends on the training set of data. If this dataset is outdated, compromised, inaccurate, or contains any bias, it can be expected that this will significantly affect the final result that the AI algorithm will reach. Bias is perhaps one of the biggest reasons for skepticism about the use of AI tools since according to some tests, AI can amplify pre-existing bias. Why is that so? Precisely because of the training set that contained bias. There is a fear that an already discriminated part of the population could suffer even more if AI makes decisions because it has been shown that, for example, facial recognition AI tested in a certain geographical location for which it is calibrated, on the population for which it is trained, can achieve very good results and be quite accurate, but if the same tool is used in a completely different location and in another population for which it was simply not trained, it can make catastrophic mistakes. A 2016 ProPublica investigation⁵² of the COMPAS (Correctional Offender Management Profiling for Alternative Sanctions), risk-assessment algorithm, found it biased against black defendants, revealing that white individuals who reoffended were often misclassified as 'low risk.' In contrast, black individuals were nearly twice as likely to be labeled as higher risk without re-offending. Moreover, only 20% of those predicted to commit violent crimes actually did so. People are prone to believe machines are almost always correct. It is important to emphasize that AI algorithms are not infallible. It so happens that in considerable percentages, they also make mistakes. Some argue that errors are due to initial bad settings, while others still find answers in the imperfections of the algorithms themselves. The fact is that AI hallucinations⁵³ can lead to serious problems, especially when it comes to the criminal justice system where every mistake can be cardinal and change someone's fate. Therefore, it is crucial for courts to scrutinize AI-generated evidence by evaluating the training data and the algorithm's design and performance in real-world scenarios.

⁵² See <https://www.propublica.org/article/how-we-analyzed-the-compas-recidivism-algorithm>, February 15, 2025.

⁵³ AI hallucination is a phenomenon wherein a large language model (LLM) often a generative AI chatbot or computer vision tool perceives patterns or objects that are nonexistent or imperceptible to human observers, creating outputs that are nonsensical or altogether inaccurate. IBM's definition, see at: <https://www.ibm.com/think/topics/ai-hallucinations>, February 20, 2025.

Prof. Damaška believes that reliance on computer-based fact-finding could result in artificial intelligence determining critical facts and even guilt, which would strip this sensitive process of its human element.⁵⁴ However, he also argued it is unreasonable to push for absolute certainty of evidence. Considering that even DNA analysis does not guarantee absolute certainty, it raises the issue of how much evidence can be considered completely certain. Even evidence that is thoroughly scientifically verified and validated does not reach total certainty. Striving for absolute certainty, which would need to be supported by mathematical proof, is in his opinion impractical, as it could result in a standstill in criminal proceedings. This is why he argues it's nearly impossible to forego a reasonable and logical method for ascertaining facts in criminal and other judicial processes. If we take into account that no scientific and forensic method of proof is 100% accurate and safe, should the very fact that there is a possibility of error in AI evidence automatically disqualify them from criminal trials?

5.2. Transparency and understanding of AI systems

The problem with AI systems is not only their opaqueness, but also the fact they are unpredictable. Their ability to learn and adapt over time makes it almost impossible to understand how or why they reach certain conclusions even for the makers. One of the most important cases showcasing the possible challenges of AI evidence use is the Loomis case. Even when the data sources and training data are identified, along with the specific parameters, AI providers often claim that the details regarding the data and algorithms are proprietary trade secrets, which leads to a refusal to reveal such information, making it difficult to contest their scientific validity and reliability, as well as to tackle other significant questions that arise.⁵⁵

In many forensic fields, there are no statistical models that are both explainable and capable of providing likelihood ratios (LRs). While some areas, like biometrics, use complex machine learning models that effectively generate LRs and are less biased than human experts, these models lack explainability. It is almost impossible to interpret parameters of these models and predict the outputs that may appear with slight changes in input data. This is why there is reason to doubt such models, especially in forensic contexts where their outputs can significantly impact lives.

⁵⁴ Mirjan Damaška is Sterling Professor Emeritus of Law at Yale Law School. He teaches and writes in the fields of comparative and foreign law, procedural law, evidence, international criminal law, and continental legal history. The views mentioned in the paper are from his lecture in Zagreb in 2019.

⁵⁵ Grimm, P. W.; Grossman, M. R.; Cormack, G. V., *Artificial Intelligence as Evidence*, 19 Nw. Journal of Technology & Intellectual Property, Volume 19, 2021, p. 63.

Expert witnesses often play a crucial role in criminal trials, with valuable insights that come from their specialized knowledge. Many experts have lately begun incorporating advanced techniques, such as probabilistic genotyping in DNA analysis, which generates a likelihood ratio (LR) to minimize human bias.⁵⁶ This transparency in methodology not only helps statisticians understand the relevant factors but also boosts acceptance of these approaches. It is logical to expect that the complex nature of AI systems will create a need for expert testimony to clarify how such evidence was produced. This reliance on specialized knowledge can be challenging, as such expertise might not be readily accessible to all parties involved or easily understood by judges and juries. It seems inevitable that litigation expenses will rise as it costs a lot to hire highly specialized experts, which will result in further difficulties for individuals to pursue justice. Furthermore, it will put even more pressure on the courts as they will need to be the ones to evaluate the qualifications of these experts and the reliability of their opinions.⁵⁷ Judges and legal experts might need education in digital forensics and AI detection to properly analyze intricate digital evidence. This training would help the judiciary assess the credibility of AI evidence more effectively. The question remains how prepared and capable the judges are at the moment of being able to make such an assessment at all, and how many resources and time need to be spent in order to train them for it.

5.3. The impact on defendants' rights

Of course, the harshest consequences will be borne by the defendant. In some cases, it will be due to the inability to examine the evidence, in other they will not even be aware of the fact that they are up against AI evidence, and sometimes the necessary data will not be provided to them because the court will decide that it is more important to protect trade secrets. One of the most important cases showcasing the possible challenges of AI evidence use is the Loomis case.⁵⁸ Even

⁵⁶ Durán, J. M.; Van der Vloed, D.; Ruifrok, A.; Ypma, R. J. F.; *From understanding to justifying: computational reliabilism for AI-based forensic evidence evaluation*, Forensic Science International: Synergy, Volume 9, 2024, 100554.

⁵⁷ Gentry, E., *The Challenges of Integrating AI-Generated Evidence Into the Legal System*, <https://www.akerman.com/en/perspectives/the-challenges-of-integrating-ai-generated-evidence-into-the-legal-system.html#:~:text=This%20article%20delves%20into%20the%20multifaceted%20challenges%20presented,discusses%20the%20broader%20implications%20for%20the%20legal%20system.> 24 February, 2025.

⁵⁸ Mr. Loomis contested the Circuit Court's use of COMPAS algorithm in his sentencing, claiming it violated his due process rights by preventing him from verifying the accuracy of the risk scores, as the proprietary nature of COMPAS kept him from understanding how these scores were calculated. He argued that without disclosure of the weighting of factors, he couldn't adequately challenge the findings that influenced his sentence. While the

when the data sources and training data are identified, along with the specific parameters, AI providers often claim that the details regarding the data and algorithms are proprietary trade secrets, which leads to a refusal to reveal such information, making it difficult to contest their scientific validity and reliability, as well as to tackle other significant questions that arise.⁵⁹ Obviously it affects the rights of defense. There is no doubt that the presumption of innocence, the principle of equality of arms, the right to a fair trial and many other guaranteed rights are at stake. Data-driven surveillance undermines the presumption of innocence by implying a prediction of criminal intent, effectively leading to a 'presumption of guilt.'⁶⁰ Scholars suggest creating a 'presumption of innocence by design' and incorporating 'explanation systems' in AI to ensure that any incriminating evidence has clear logic and can be examined.⁶¹ In law enforcement, the default configurations of these technologies should avoid reversing the presumption of innocence, particularly when data-mining highlights suspicious behaviors.⁶² Equality of arms exists to give both the prosecution and the defense equal opportunities to present their cases. It is essential for preserving the dignity of the accused as it gives them the right to actively participate in proceedings that can greatly impact their life. The application of defense rights to evidence obtained from devices remains uncertain. In today's digital world, the traditional right for defendants to review the prosecution's evidence may not suffice when evidence comes from automated devices. Defendants need access not only to the data these devices produce but also to understand how the devices arrive at their conclusions. This raises the question of whether the right to a fair trial includes access to the decision-making processes of such devices in a way that can be verified.

6. CONCLUSION

The use of artificial intelligence (AI) evidence supposedly has the potential to enhance the efficiency of legal proceedings. However, we are often warned it comes with a great price - it also raises critical ethical and practical concerns. AI is much better and faster than humans in analyzing huge amounts of data and thus makes fact-finding much easier. But it relies heavily on the quality of data which

Wisconsin Supreme Court acknowledged that Loomis couldn't challenge the algorithm itself, it stated he could dispute the risk scores based on his criminal history and provided information. The Court noted that COMPAS primarily relies on static data, which Loomis could verify, allowing him to argue for potential inaccuracies in his risk assessment.

⁵⁹ Grimm, P.W., Grossman, M.R. and Cormack, G.V., *op. cit.*, p. 63.

⁶⁰ Hildebrandt, M., *Criminal Law and Technology in a Data-Driven Society*, The Oxford Handbook of Criminal Law (2014; online edition, Oxford Academic, 2015), accessed March 2025.

⁶¹ *Ibid.*

⁶² *Ibid.*

makes it especially prone to bias. If historical data reflects some societal prejudices, those may be uncovered in the results reached by AI systems as well. Of course, this means the fairness of such processes is questionable and marginalized communities are at even higher risk of being discriminated against. One of the biggest problems is lack of transparency and human control, especially in criminal cases where people's fate relies fully on the fairness and accuracy of the criminal proceedings. Should a human investigator control AI output? Should AI evidence even be considered evidence or just be considered as leads in criminal investigation? Can prosecutors choose when to include AI evidence as evidence in criminal proceedings? Can we talk about fair trial if all the participants of a criminal proceeding are not aware AI evidence is part of evidence? Is the reluctance of courts to give defense access to information needed for an independent validation of AI evidence because of trade secrets justifiable? Truth be told, defense lawyers are right to be concerned about the tilt of balance on the side of law enforcement and the fact AI tools are being used extensively in criminal cases. Many AI algorithms operate as "black boxes," which means we have no understanding of the process that led to the decision and have no means to judge if it was reached fairly and correctly. The problem with AI is that even if the defense was given complete access and source code, because of the nature of AI systems that infer on the given data and autonomously reach the decisions, they would still be unable to explain how or why the decision was reached and if the system is reliable. Basically, we have no idea if these algorithms work at all. It inevitably causes struggles to lawyers and judges. Additionally, there are many ethical implications that cannot be overlooked. AI technologies such as facial recognition (while being error-prone) have potential to infringe on our privacy rights. Some would argue that mere collection of personal data is problematic. There is a fine line the Courts must draw between legality and necessity of such breaches and people's rights to privacy and due process. Yes, there are privacy and data protection tools already in place, but are they enough, or do we need more specific tools in criminal law proceedings? If we decide the benefits are so undeniable that AI evidence must be allowed, we must make sure it meets the established legal standards for evidence admissibility. That is the only way we can preserve the integrity of the criminal justice system. The problem is, there is no such standardized test in the European Union.

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