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Artificial Intelligence in the Prosecution of International Crimes

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I. INTRODUCTION

Criminal proceedings for war crimes, crimes against humanity, and genocide typically concern massive atrocities, with a scale and patterns of violence that involve a large number of actors (victims, perpetrators, and witnesses), spanning large geographical areas and extended periods of time. These complex proceedings require the analysis of extensive information and evidentiary material, such as documents, photographs, videos, phone records, and intercepted communications, often in digital format. Recent conflicts, including those in Gaza and Ukraine, illustrate the vast amount of documentation and reporting generated in real time. This includes heterogeneous and unstructured data, such as user-generated videos and social media content to document atrocities.

While technological advancements have significantly enhanced the documentation of international crimes, AI-based technologies have also been harnessed from parties to the conflict for military purposes, which could potentially be associated with the commission of crimes. This includes the use of AI-decision support systems for targeting,¹ cloud to store military intelligence, and surveillance data for targeting purposes,² as well as the use of the same data to train ChatGPT-like tools for carrying out arrests.³

Whether used for documentation and reporting, for military purposes, or law enforcement (and potentially leading to crimes), large amounts of digital data are a substantial burden on investigators, prosecutors, and judges, who must process and analyze an ever-growing volume of material. The term “digital derived evidence,” as coined by the Leiden Guidelines, usefully capture both evidence “originating from a ‘computer environment,’” as well as “digitized evidence,” which is analogue material that has been transferred to

1. Jessica Dorsey & Marta Bo, *AI-Enabled Decision-Support Systems in the Joint Targeting Cycle: Legal Challenges, Risks, and the Human(e) Dimension*, 106 INTERNATIONAL LAW STUDIES — (2025).

2. Yuval Abraham, “Order from Amazon”: How Tech Giants Are Storing Mass Data for Israel’s War, +972 MAGAZINE, (Aug. 4, 2024), <https://www.972mag.com/cloud-israeli-army-gaza-amazon-google-microsoft/>.

3. Yuval Abraham, *Israel Developing ChatGPT-like Tool That Weaponizes Surveillance of Palestinians*, +972 MAGAZINE, <https://www.972mag.com/israeli-intelligence-chatgpt-8200-surveillance-ai/> (Mar. 6, 2025).

a digital format.⁴ Such increasing digital evidentiary complexity has contributed, among other factors, to delays and inefficiencies in international criminal proceedings, leading to criticism against the International Criminal Court (ICC).

Given that processing such a volume of evidence for the purpose of assigning individual responsibility for international crimes “may turn out to be a laborious and intricate task, requiring long hours of humans painstaking analysis,”⁵ a pertinent question arises: to what extent might AI be able to assist in this process? Could AI enhance the efficiency and effectiveness of proceedings by assisting parties in international criminal trials?

One of the key advantages of AI systems is the ability to process extensive datasets with remarkable speed and find associations in large volumes of data. Yuriy Belousov, head of the war crimes department of the office of the prosecutor general in Ukraine stated,

we started looking for tools that allow us to work with a large amount of data, to look for certain trends. If we talk about the propaganda used by the enemy, with the help of Microsoft tools, investigators can search by certain parameters and process huge amounts of information within a few hours.⁶

This raises an important question for both practitioners and scholars in the field of international criminal justice: how can AI be effectively harnessed to analyze and process large volumes of data that may document—and potentially provide evidence of—the commission of international crimes?

Related to this, in 2023 the ICC launched project Harmony, which utilizes cloud computing and AI to analyze extensive and complex evidence.⁷

4. *Introduction*, LEIDEN GUIDELINES ON THE USE OF DIGITALLY DERIVED EVIDENCE, <https://leiden-guidelines.netlify.app/guidelines/#a-definition-of-dde> (last visited Aug. 12, 2025).

5. Xabier Agirre Aranburu, *Methodology for the Criminal Investigation of International Crimes*, in COLLECTIVE VIOLENCE AND INTERNATIONAL CRIMINAL JUSTICE: AN INTERDISCIPLINARY APPROACH 355, 355–56 (Alette Smeulers ed., 2004).

6. Olga Golovina, *Ukraine: Artificial Intelligence and War Crimes Investigations*—OpEd, EURASIA REVIEW (Feb. 2, 2024), <https://www.eurasiareview.com/02022024-ukraine-artificial-intelligence-and-war-crimes-investigations-oped/>.

7. On project Harmony, which complements the prior initiative ‘OTP link advanced evidence submission platform’, see ICC Prosecutor Karim A.A. Khan KC Announces Launch of Advanced Evidence Submission Platform: OTPLink, <https://www.icc-cpi.int/news/icc-prosecutor-karim-aa-khan-kc-announces-launch-advanced-evidence-submission-platform-otplink> (May 24, 2023); Hayley Evans & Mahir Hazim, *Digital Evidence Collection at the Int’l Criminal*

More generally, the ICC has made it a priority to leverage AI and new technologies to increase the efficiency of proceedings.⁸ In the 2024 Policy on Cooperation and Complementarity, the Office of the Prosecutor stated the intention to “partner[] with Microsoft, Accenture Avanade and other technology actors to develop cutting-edge solutions for the analysis of large volumes of digital data composed of heterogenous file types, much of it photographs, videos, and audio files.”⁹

In addition to its role in supporting investigations, a less frequently explored but equally relevant question concerns how AI could be used to enhance the efficiency of international criminal proceedings themselves—for instance, by automating the summarization of witness testimonies, or supporting their translation, transcription, and review.

The use of AI in international criminal proceedings is still in its early stages, partly due to the legal profession’s general reluctance to adopt new technologies.¹⁰ However, interest is growing. The International Bar Association has circulated a survey across ICC sections to assess potential AI applications, while other actors are convening expert meetings to explore the legal and practical implications of integrating AI into international criminal proceedings.¹¹ Against this backdrop, this article aims to map potential applications of AI in international criminal proceedings, with a focus on the ICC. Drawing on available public information and insights from comparative analysis of AI uses in national criminal jurisdictions, it identifies key areas of application and associated risks, and assesses their implications for fundamental principles of international criminal law, as well as the rights and duties of the parties of proceedings.

Court: Promises and Pitfalls, JUST SECURITY (July 5, 2023), <https://www.justsecurity.org/87149/digital-evidence-collection-at-the-intl-criminal-court-promises-and-pitfalls/>.

8. ICC OFFICE OF THE PROSECUTOR, STRATEGIC PLAN 2023–2025 (2023), <https://www.icc-cpi.int/sites/default/files/2023-08/2023-strategic-plan-otp-v.3.pdf>.

9. ICC OFFICE OF THE PROSECUTOR, POLICY ON COMPLEMENTARITY AND COOPERATION, ¶ 65 (Apr. 2024), <https://www.icc-cpi.int/sites/default/files/2024-04/2024-comp-policy-eng.pdf>; see also Karim Khan, *Innovation and Technology in Building Modern Investigations and Prosecutions at the ICC*, in *THE INTERNATIONAL CRIMINAL COURT IN ITS THIRD DECADE* (Carsten Stahn ed., 2023).

10. Lindsay Freeman, *Weapons of War, Tools of Justice: Using Artificial Intelligence to Investigate International Crimes*, 19 JOURNAL OF INTERNATIONAL CRIMINAL JUSTICE 35, 46 (2021).

11. The ICCBA working group on AI is led by Hélène Raïs. *Counsel Support Staff Committee*, INTERNATIONAL CRIMINAL COURT BAR ASSOCIATION, <https://www.iccbar-abcpi.org/cssc#:~:text=HÉLÈNE%20RAÏS,topics%20for%20the%20Staff's%20interests> (last visited Aug. 12, 2025).

While prosecutions for international crimes take place in different institutional settings—international, hybrid, or national—this article focuses on the ICC mostly because the ICC possesses significant resources that could be leveraged for AI integration, and several of its sections have already expressed interest in exploring AI-driven solutions. This also entails that, since the ICC is a hybrid system combining elements of both accusatorial and inquisitorial traditions, some insights and observations made in this article may not be readily transposable to other legal frameworks.¹² At the same time, the article adopts a crime-specific approach, by considering the distinctive features of international crimes—such as contextual elements and linkage evidence—and explores how AI might be leveraged to support such evidentiary tasks. As a result, several of the observations made, especially when it comes to mapping AI uses, may also hold relevance beyond the ICC framework and in particular for hybrid tribunals.

II. SUPPORTING, NOT DECIDING: THE ROLE OF AI IN ESTABLISHING CONTEXTUAL ELEMENTS AND LINKAGE EVIDENCE IN INTERNATIONAL CRIMINAL PROSECUTIONS

This part provides a theoretical framing for AI in international criminal prosecutions and defines the current scope of AI integration in this field. I argue that the current role of AI in international criminal proceedings primarily supports certain tasks rather than replacing judicial decision-making.

There are various definitions of AI.¹³ Some refer to a system's "ability to perceive, to pursue goals, to initiate actions and to learn from a feedback loop"¹⁴ or "systems that display intelligent behaviour by analysing their environment and taking actions—with some degree of autonomy—to achieve specific goals."¹⁵ Other definitions of AI are task-specific and center around the theory and development of computer systems capable of performing

12. Bertram Schmitt, *Legal Diversity at the International Criminal Court*, 19 JOURNAL OF INTERNATIONAL CRIMINAL JUSTICE 485 (2021).

13. AI is an umbrella term that encompasses a wide variety of computational methods, including machine learning (ML), deep learning (DL), and natural language processing (NLP).

14. DENKWERK, ARTIFICIAL INTELLIGENCE IN NEDERLAND: ZELF AAN HET STUUR (July 2018), https://denkwerk.online/media/1029/artificial_intelligence_in_nederland_juli_2018.pdf.

15. INDEPENDENT HIGH-LEVEL EXPERT GROUP ON ARTIFICIAL INTELLIGENCE, A DEFINITION OF AI: MAIN CAPABILITIES AND SCIENTIFIC DISCIPLINES (Apr. 8, 2019), https://ec.europa.eu/newsroom/dae/document.cfm?doc_id=56341.

tasks that historically required human intelligence, such as recognizing speech, and identifying patterns.¹⁶

In national criminal law, one of the most reported uses of AI is to establish the defendant's or convicted individual's probability of recidivism. To a certain extent, such AI uses replace judges' decision-making on pre-trial detention, sentencing, or early release.¹⁷ However, risk-scoring decisions are minimal or nonexistent in international criminal tribunals. Instead, AI primarily assists with specific tasks in investigations, prosecutions, and trials of international crimes.

To determine for which tasks AI can be leveraged, it is essential to understand the nature of international crimes and how proving them differs from national crimes. First, international crimes require proving specific contextual elements in addition to the standard components of criminal responsibility, namely *actus reus* (the physical act) and *mens rea* (the mental state). Prosecuting international crimes requires not just proof that a single crime (such as a murder) took place, but other "contextual elements" that indicate the scale and patterns of violence, such as the gravity and the collective dimension of the offence.¹⁸ These contextual elements are essential to elevating the offence to an international crime under ICC jurisdiction. For example, crimes against humanity must be committed as part of a widespread or systematic attack directed against a civilian population. The *actus reus* of a war crime must occur in an armed conflict.¹⁹ Proving contextual elements, in essence, is about linking defendants with particular acts and contexts.²⁰

16. On the complexities of defining AI and different definitions, see HAROON SHEIKH ET AL., *MISSION AI: THE NEW SYSTEM TECHNOLOGY* 15–20 (2023).

17. Jacob O Arowosegbe, *Data Bias, Intelligent Systems and Criminal Justice Outcomes*, 31 *INTERNATIONAL JOURNAL OF LAW AND INFORMATION TECHNOLOGY* 22, 25 (2023).

18. On the substantive and jurisdictional rationales beyond contextual elements, see Mark Osiel, *Guest Post: Why the "Contextual Element" in All ICC Crimes?*, *OPINIO JURIS* (Sept. 7, 2009), <http://opiniojuris.org/2009/09/07/guest-post-why-the-contextual-element-in-all-icc-crimes/>.

19. Article 7 of the ICC Statute adds an element, namely that a crime against humanity is a crime committed in furtherance of a State or organizational policy. Rome Statute of the International Criminal Court art. 7(2)(a), July 17, 1998, 2187 U.N.T.S. 90. See also INT'L CRIM. CT., *ELEMENTS OF CRIMES*, Article 6: Genocide, (2013) (including as an element of every form of the crime of genocide that, "[t]he conduct [killing, causing serious bodily or mental harm, etc.] took place in the context of a manifest pattern of similar conduct directed against that group or was conduct that could itself effect such destruction").

20. Jens David Ohlin, *Second-Order Linking Principles: Combining Vertical and Horizontal Modes of Liability*, 25 *LEIDEN JOURNAL OF INTERNATIONAL LAW* 771, 772 (2012).

Second, another critical aspect in prosecuting international crimes is establishing the linkage between high-level perpetrators and the underlying crimes. Given the often hierarchical nature of such offences and the complementary function of the ICC in relation to national jurisdictions, it is essential to demonstrate a connection between the conducts, such as orders or directives of high-ranking individuals, and the criminal acts carried out by subordinates or low-echelon perpetrators.²¹ This linkage ensures that those in positions of authority are held responsible for crimes they orchestrate or facilitate (by actions or omissions), even if they do not directly execute the unlawful acts. Most evidence in international crime cases is linkage evidence.²²

So, on the one hand, prosecutions of international crimes require pattern of crime investigations that boil down to aggregate “multiple incidents that share common features related to the victims, the perpetrators, and the *modus operandi*.”²³ In the context of patterns of crime investigations, some of the factors that may be taken into account in determining whether an attack meets either or both conditions (widespread or systematic) for crimes against humanity include: “the consequences of the attack on the civilian population targeted, the number of victims, the nature of the acts, the possible participation of political officials or authorities, or any identifiable pattern of crime in the sense defined above.”²⁴

With regard to linkage evidence, for command responsibility, for example, factors that are taken into account are orders, instructions, directives by commanders, internal communications that inform the commander about ongoing or completed crimes, and financial records that link the commander to the crimes. These could materialize in many formats: written, audio, or video.

21. Kai Ambos, *Command Responsibility and Organisationsherrschaft: Ways of Attributing International Crimes to the “Most Responsible”*, in *SYSTEM CRIMINALITY IN INTERNATIONAL LAW* 127 (André Nollkaemper & Harmen van der Wilt eds., 2009).

22. Elinor Fry, *The Nature of International Crimes and Evidentiary Challenges*, in *PLURALISM IN INTERNATIONAL CRIMINAL LAW* 251 (Elies van Sliedregt & Sergey Vasiliev eds., 2014) 267.

23. Xabier Agirre Aranburu, *Sexual Violence Beyond Reasonable Doubt: Using Pattern Evidence and Analysis for International Cases*, 23 *LEIDEN JOURNAL OF INTERNATIONAL LAW* 609 (2010).

24. *See, e.g.*, Prosecutor v. Prlić, Case No. IT-04-74-T, Trial Judgement, vol. 1, ¶¶ 41–42 (Int’l Crim. Trib. for the former Yugoslavia May 29, 2013).

The quantity of evidence has long been a challenge in international criminal prosecutions.²⁵ Traditionally reliant on documentary records and witness testimony, these prosecutions have been increasingly dealing with vast and diverse sources, including user-generated content, open-source information, satellite imagery, mobile phone data, etc. The increasing volume and complexity of evidence impact both fact-finding and trial proceedings. The following parts will examine the potential roles and tasks AI could undertake to manage this growing information and evidentiary burden, respectively, in these two phases of international criminal proceedings.

III. AI FOR FACT-FINDING IN INTERNATIONAL CRIMINAL PROCEEDINGS

The fact-finding phase in international criminal prosecutions focuses on establishing crime patterns—linking incidents having common patterns and features with contexts—and gathering linkage evidence to connect high-level perpetrators to specific acts, subordinates, and contexts. AI could significantly aid this process.²⁶ Arguably, a key role that AI could perform is to assist investigators and prosecutors via facial and voice recognition technologies. Another role refers to AI models that could help in establishing patterns and networks. The next two sections will turn to these potential AI uses, highlighting both their potential and their risks, in light of the specific features of international crime prosecutions.

A. Biometrics: AI-Based Facial Recognition for Identifying Perpetrators and Victims

From a technical perspective, facial recognition technologies utilize AI algorithms to identify individuals in images and videos by analyzing distinct facial features. In a nutshell:

The process of using the biometric point-based system is composed of four main steps. The first is finding face(s) within a photo or a video sequence (both can contain more than one face). The second step is to extract the available data about the obtained face, and the third step is to process that

25. Fry, *supra* note 23, at 265–71.

26. Roman Avramenko, co-founder of Truth Hounds noted that AI “identifies all the incidents that have occurred over a certain period of time. AI builds a chronology, identifies places and establishes connections.” Golovina, *supra* note 6.

data into the biometric point-based system and create a mathematical formula called a “faceprint”. The fourth step is to compare the new faceprint with an existing database.²⁷

In the context of criminal proceedings, these technologies can be leveraged in several ways. For instance, they can be used to identify perpetrators by matching a face captured in a video or photograph to a suspect or a database. For instance, it has been reported that Ukrainian authorities, among other tools, are employing facial recognition AI, including (the very controversial) Clearview AI system²⁸ to identify Russian soldiers accused of war crimes.²⁹ Additionally, facial recognition can assist in identifying victims, for example by analyzing videos depicting mass executions, or analyzing old war footage or mass grave photographs.

A significant advancement in facial recognition technology has been the shift from a single-mode approach—traditionally reliant on comparison with a single photograph—to a multi-source approach. This approach entails the analysis, interpretation, and cross-reference of data from different sources,

27. Ido Rosenzweig & Magdalena Pacholska, *The Use of Facial Recognition for Targeting under International Law*, INTERNATIONAL REVIEW OF THE RED CROSS 1, 5 (June 2025), <https://international-review.icrc.org/articles/the-use-of-facial-recognition-for-targeting-under-international-law-928>.

28. As reported by the *New York Times*:

Clearview AI, which is based in New York, scraped billions of photos from the web and social media sites like Facebook, LinkedIn and Instagram to build a facial recognition app used by thousands of police departments, the Department of Homeland Security and the F.B.I. After The New York Times revealed the company’s existence in 2020, lawsuits were filed across the country.

Kashmir Hill, *Clearview AI Used Your Face. Now You May Get a Stake in the Company*, NEW YORK TIMES (June 13, 2024), <https://www.nytimes.com/2024/06/13/business/clearview-ai-facial-recognition-settlement.html?smid=nytcore-ios-share&referringSource=articleShare>. “In Canada, the Royal Canadian Mounted Police (RCMP) and other policing agencies, including the Toronto Police Service and the Ontario Provincial Police, have already been called out by the Office of the Privacy Commissioner of Canada for using the Clearview AI technology to conduct mass surveillance,” and as a consequence “the Toronto Police Services suspended use of that product.” Kevin Walby et al., *AI Used by Police Cannot Tell Black People Apart and Other Reasons Canada’s AI Laws Need Urgent Attention*, THE CONVERSATION (Aug. 25, 2024), <https://theconversation.com/ai-used-by-police-cannot-tell-black-people-apart-and-other-reasons-canadas-ai-laws-need-urgent-attention-236752>.

29. Vera Bergengruen, *Ukraine’s “Secret Weapon” Against Russia Is a Controversial U.S. Tech Company*, TIME (Nov. 14, 2023), <https://time.com/6334176/ukraine-clearview-ai-russia/>; Golovina, *supra* note 6.

such as images, video, and audio, to enhance the accuracy and reliability of facial recognition.³⁰ Arguably, this approach, by improving identification capabilities, could be key in international criminal prosecutions, particularly when single-source data may be insufficient or unreliable, or in any case to corroborate AI outputs with different sources.

While these systems are improving, it is important to underscore the risks of false positives and false negatives that they might entail. Both have evident consequences for criminal prosecutions in terms of false incriminatory evidence or missing exculpatory evidence. False positive means that the facial recognition technology will alert the user that the two photos being compared are similar even though they are not. This would lead to the false identification of one person as someone else. False negatives relate to situations where the system fails to identify a specific person, therefore placing an innocent person at risk of getting arrested or wasting ICC resources on a suspect who isn't the right person.

Misidentifications in facial recognition technologies may stem from several factors. First, there are well-known bias issues. Many facial recognition systems are trained predominantly on light-skinned subjects. As a result, they tend to perform less accurately when identifying individuals from underrepresented groups.³¹ AI-powered facial recognition systems used by police have a troublingly high rate of false matches (i.e., false positives) for people of color, leading to wrongful arrests in the United States.³² If we think

30. Rosenzweig & Pacholska, *supra* note 27; Wenyi Zhao et al., *Face Recognition: A Literature Survey*, 35 ACM COMPUTING SURVEYS 399 (2003).

31. Patrick Grother et al., FACE RECOGNITION VENDOR TEST (FRVT): PART 3: DEMOGRAPHIC EFFECTS, NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (DEC. 2019), [HTTPS://DOI.ORG/10.6028/NIST.IR.8280](https://doi.org/10.6028/NIST.IR.8280). In a nutshell, this report concluded that: (1) For one-to-one matching, most systems had a higher rate of false positive matches for Asian and African-American faces over Caucasian faces, sometimes by a factor of ten or even one hundred. In other words, they were more likely to find a match when there wasn't one. (2) This changed for face recognition algorithms developed in Asian countries, which produced very little difference in false positives between Asian and Caucasian faces. (3) Algorithms developed in the United States were all consistently bad at matching Asian, African-American, and Native American faces. Native Americans suffered the highest false positive rates. (4) One-to-many matching systems had the worst false positive rates for African-American women, which puts this population at the highest risk for being falsely accused of a crime. Karen Hao, *A US Government Study Confirms Most Face Recognition Systems Are Racist*, MIT TECHNOLOGY REVIEW (Dec. 20, 2019), <https://www.technologyreview.com/2019/12/20/79/ai-face-recognition-racist-us-government-nist-study/>.

32. [Kevin Walby](#) et al., *supra* note 28.

about conflict zones and situations and cases before the ICC, where victims and perpetrators are predominantly from underrepresented ethnicities and races, bias in facial recognition technology could lead to serious consequences in terms of misidentification of suspects or victims or the failure to identify them altogether.

It has been pointed out that “[t]o minimize the risk of false positives, some algorithms have a confidence threshold that will only return a positive result if the analysis leads, for example, to 99% certainty. The cost of using such a safety mechanism, however, is a significant increase in false negative results.”³³ In practical terms, this means that while the system minimizes the likelihood of mistakenly identifying a suspect or a defendant as a match, it also increases the risk of failing to identify them in imagery material. This trade-off has critical implications for investigations, as it may result in overlooking evidence or situations where suspects could have been present, which could in turn lead to either incriminatory or exculpatory evidence.

The environment where photographs and videos are taken also matters. facial recognition technology systems may be more accurate in controlled environments (like passport and photo captures) but struggle more with uncontrolled and cluttered environments (e.g., war zones and refugee camps).³⁴ In conflict zones, user-generated images or videos may be taken under suboptimal conditions. Also, poor-quality surveillance footage from, for example, surveillance drones, may impair the accuracy and the confidence score of facial recognition technologies, leading to inaccurate matches in AI systems.

Another source of error rates could be deepfake and AI manipulation. These refer to “synthetic media—image, audio, or video that has been artificially produced or manipulated, especially through use of AI.”³⁵ For example, let us take the *Werfalli* case, where the prosecutor successfully relied on social media posts depicting incidents and executions to demand the issuance of a warrant of arrest against Mr. Al-Werfalli. What if the Werfalli videos had been forged with the objective of incriminating him, exculpating others, and building false narratives?³⁶ The dangers of relying on manipulated

33. Rosenzweig & Pacholska, *supra* note 27, at 6.

34. *Id.*

35. Vázquez Llorente & Yvonne McDermott, Truth, Trust, and AI: Justice and Accountability for International Crimes in the Era of Digital Deception, JUST SECURITY (June 17, 2024), <https://www.justsecurity.org/96731/truth-trust-and-ai-justice-and-accountability/>.

36. Khan, *supra* note 9, at 118.

digitally derived evidence are profound in terms of investigations of international crimes. Such videos could theoretically result in everything from false convictions to weakening prosecution cases and whole investigations.

B. Biometrics: AI-Based Speech Recognition for Identifying Perpetrators and Victims

Another area where AI is emerging as a critical tool and could contribute to investigatory efforts for international crimes is AI speech recognition or automatic speech recognition and speech pattern analysis.³⁷ Despite its potential, the role of AI-driven voice recognition and speech analysis in criminal investigations has received relatively limited scholarly and practical attention. However, with the widespread use of smartphones capable of easily recording audio and video, voice evidence is becoming more prevalent and holds significant potential for enhancing investigations and prosecutions.³⁸

“A person’s voice, like fingerprints or DNA, is unique due to physiological and behavioral factors.”³⁹ Automatic speech recognition could be leveraged for identity verification, that is determining who is speaking based on vocal and speech patterns, by analyzing voiceprints with machine learning algorithms that consider features like pitch, tone, and accents.

In investigations of international crimes, AI-driven voice analysis could be helpful in the analysis of communications, such as phone calls and social media, by quickly and accurately matching voice samples with database records, aiding in suspect or victim identification. Similarly, it could be applied to radio and phone recordings where it could match voices to known defendants to identify, for example, whether they gave orders or incited crimes.

While it has potential, the limitations of automatic speech recognition might have serious implications for investigations and prosecutions. Similarly to risks with facial recognition, speech recognition systems do not perform equally well for all subgroups of the population. Bias research shows

37. P Renukadevi, Sincy John and N Shivani, *Forensic Science: AI-Powered Image and Audio Analysis* 2024 5th International Conference on Smart Electronics and Communication (ICOSEC), Trichy, India, 2024, https://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=10722068&casa_token=C9G5uELS-MqMAAAAA:h2nUnxII3a6vh9_QHQiNVIHTnG-lqoLpm8buLpoZniTxyYIHu5aXrIlyXSsm2jMVD-45brtjBmxg&tag=1

38. Amelia Gully et al., *How Voice Analysis Can Help Solve Crimes*, FRONTIERS FOR YOUNG MINDS (Feb. 14, 2022), <https://kids.frontiersin.org/articles/10.3389/frym.2022.702664>.

39. Pragati Jain et al., *Advancements in Forensic Voice Analysis: Legal Frameworks and Technology Integration*, 7 ASIAN JOURNAL OF ADVANCES IN RESEARCH 369, 380 (2024).

large racial disparities in the performance of speech recognition systems.⁴⁰ “[Automatic speech recognition] systems exhibited substantial racial disparities, with an average word error rate (WER) of 0.35 for Black speakers compared with 0.19 for white speakers.”⁴¹ What is clear across multiple studies is that training data has led machines to learn more about white men’s speech patterns and less about those of women and people of color. Around gender bias, other studies show that Google’s speech recognition is 13 percent more accurate for men than it is for women.⁴²

Other factors affecting the accuracy of speech recognition stem from incomplete training data. Studies show a lack of full representation of African American language data to train speech recognition systems.⁴³ Similarly, a forensic voice recognition system trained primarily on European French may struggle to accurately process African French dialects spoken in conflict zones. Differences among training data and context of use might include cultural variations of speech such as morphosyntactic and phonological structures.⁴⁴ Therefore, if the ICC were to develop an AI model—such as a ChatGPT-like tool—designed to analyze intercepted communications and large volumes of data in a situation they are investigating, it would likely face the challenge of the model not being sufficiently trained on local dialects.

Moreover, when analyzing crimes or illegal commands, it is crucial to recognize that orders to commit violence may be conveyed indirectly, through euphemisms, or in coded language. For example, on social media and dark net marketplaces “weed” is used instead of “marijuana” for illicit transactions. Studies emphasize the difficulty AI systems face in identifying such disguised language, which is essential for accurate evidence gathering.⁴⁵

40. Allison Koenecke et al., *Racial Disparities in Automated Speech Recognition*, 117 PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA 7684 (2020); see also Sharad Goel et al., *The Race Gap in Speech Recognition Technology*, STANFORD ENGINEERING, <https://fairspeech.stanford.edu> (last visited Aug. 12, 2025).

41. Koenecke et al., *supra* note 40; see also Goel et al., *supra* note 40.

42. Joan Palmiter Bajorek, *Voice Recognition Still Has Significant Race and Gender Biases*, HARVARD BUSINESS REVIEW (May 10, 2019), <https://hbr.org/2019/05/voice-recognition-still-has-significant-race-and-gender-biases>.

43. Joshua L. Martin, *Automatic Speech Recognition Systems, Spoken Corpora, and African American Language: An Examination of Linguistic Bias and Morphosyntactic Features* (2022) (Ph.D. dissertation, University of Florida), <https://www.proquest.com/docview/2676147443>.

44. Joshua L. Martin & Kelly Elizabeth Wright, *Bias in Automatic Speech Recognition: The Case of African American Language*, 44 APPLIED LINGUISTICS 613, 615–617 (2023).

45. Yuxue Hu et al., *Uncovering and Mitigating the Hidden Chasm: A Study on the Text-Text Domain Gap in Euphemism Identification*, 38 PROCEEDINGS OF THE AAAI CONFERENCE ON

If AI-based systems fail to detect these implicit commands and euphemisms, critical information and evidence could be overlooked or misinterpreted. One possible solution could be for investigators to manually flag known codes or euphemisms like “weed” as suspicious, thereby combining machine learning techniques with rule-based, human-guided interventions.

The voice can be altered naturally and through technical means, intentionally or unintentionally. Emotions, for instance, naturally affect vocal attributes such as pitch, tempo, and intensity. Several studies emphasize that emotions have a significant impact on forensic voice comparison and speaker verification systems. The presence of emotion in speech can negatively affect the accuracy and reliability of verification.⁴⁶ This is a factor that warrants careful consideration in the context of international crime prosecutions. These are inherently laden with intense emotions, both during the commission of crimes and throughout the trial.

Deepfake technology poses significant challenges not only to facial recognition systems but also to speech recognition technologies. The manipulation of audio to create fabricated audio recordings—known as speech deepfakes—can undermine the reliability of analysis of audio recordings and voices in criminal investigations. As deep-fake technology becomes more sophisticated and accessible, authenticity/deep fake detection methods for audio recordings are crucial.⁴⁷

C. AI for Identifying Patterns of Violence and Command Structures

In addition to and combined with AI face and voice recognition tools, AI could be harnessed to analyze unstructured data, such as videos and images

ARTIFICIAL INTELLIGENCE 18270 (2024). For some solutions, this study proposes integrating prior knowledge and specific prompts to enable AI models like ChatGPT to effectively identify and label drug trafficking activities, even when euphemisms and coded terms are used.

46. Mohammed Hamzah Abed & Dávid Sztahó, Conference Paper, *Effects of Emotional Speech on Forensic Voice Comparison Using Deep Speaker Embeddings*, Hungarian Computational Linguistics Conference, vol. 19, at 159 (2023); Rushab Munot & Ani Nenkova, *Emotion Impacts Speech Recognition Performance*, PROCEEDINGS OF THE 2019 CONFERENCE OF THE NORTH AMERICAN CHAPTER OF THE ASSOCIATION FOR COMPUTATIONAL LINGUISTICS: STUDENT RESEARCH WORKSHOP 16 (2019), https://acta.bibl.u-szeged.hu/78411/1/msznykonf_019_159-170..pdf

47. Maria Paz Sandoval et al., *Threat of Deepfakes to the Criminal Justice System: A Systematic Review*, 13 CRIME SCIENCE 1 (2024).

(such as from drones, CCTV, and social media), satellite imagery, text documents (such as reports, testimonies, and legal filings), and intercepted communications (such as phone calls and radio messages), to infer organizational relationships, including hierarchies, organizational structure, and patterns.

AI can be leveraged to identify groups of crimes that are similar in *modus operandi*, such as a crime series consisting of break-ins within a similar location on weekdays. For example, the New York Police Department has been using algorithms for crime series detection. “Patternizr” is a predictive policing tool in use since 2016 (arguably the first one) that assists investigators in recognizing “robberies, burglaries, and grand larcenies that may have been committed by the same person or group of people.”⁴⁸ Such a tool could be of great relevance in criminal proceedings for international crimes for establishing patterns and linkages between high-level perpetrators and crimes.

These systems are much more sophisticated than E-discovery tools that have been used for a long time.⁴⁹ And even recent evidence categorization systems that have been implemented by the EU Agency for Criminal Justice Cooperation (Eurojust) and the ICC Office of the Prosecutor (OTP).⁵⁰ In these, AI is used for multi-format evidence processing and to automatically process, categorize, and cross-reference evidence in different formats, significantly reducing manual workload. Similarly, in the Netherlands, the National Forensics Institute developed a system called Hansken.

This system, an example of big data analytics, can process large amounts of data from different sources and in different formats (such as text, video,

48. Molly Griffard, *A Bias-Free Predictive Policing Tool?: An Evaluation of the NYPD’S Patternizr*, 47 FORDHAM URBAN LAW JOURNAL 43 (2019).

49. E-discovery tools are “based on conventional search algorithms (i.e. search by keywords) have been used for a relatively long time in the legal profession in order to automate—at least partially—the review process and therefore improve efficiency and effectiveness,” EU-LISA & EUROJUST, ARTIFICIAL INTELLIGENCE SUPPORTING CROSS-BORDER COOPERATION IN CRIMINAL JUSTICE (June 2022), <https://www.eurojust.europa.eu/sites/default/files/assets/artificial-intelligence-cross-border-cooperation-criminal-justice-report.pdf>, 20.

50. Eurojust has implemented the Core International Crimes Evidence Database, a system for preserving, analyzing, and sharing evidence related to international crimes. *See Core International Crimes Evidence Database*, EUROPEAN UNION AGENCY FOR CRIMINAL JUSTICE COOPERATION, <https://www.eurojust.europa.eu/core-international-crimes-evidence-database> (last visited Aug. 13, 2025). The OTPLink, a new online platform introduced by the ICC, allows witnesses of international crimes to submit real-time information directly to prosecutors. It complements Project Harmony, the ICC’s digitalization initiative using cloud computing and AI to process and analyze complex evidence. Evans & Hazim, *supra* note 7.

audio, etc.), including storage, indexation and making the data searchable. The labelling of data is automated. The searchability of the seized data increases the effectiveness of criminal investigations.⁵¹

Moreover, as reported by Milaninia, criminal analysts have long utilized data management systems to visualize networks, conduct social network analysis, and examine geospatial or temporal relationships to uncover hidden connections and patterns. Analysts at the International Criminal Tribunal for the former Yugoslavia (ICTY) relied on tools like Analysts Notebook, ZyFIND, and CaseMap. These systems allowed them to organize and categorize information with analytical notes or tags in a single database, enabling flexible filtering and reorganization of data for deeper analysis. Similarly, at the ICC, OTP analysts use a fact analysis database to support investigations, collating and integrating all sources of evidence related to relevant groups, locations, individuals, and other entities.⁵²

However, none of these tools equate to the potential of machine learning (ML) models. ML algorithms can analyze thousands of reports, videos, and witness testimonies to identify recurring patterns of violence and links between senior military or political figures and actors on the ground. For example, in April 2023, Palantir entered into an agreement with Ukraine's Prosecutor General's Office. This collaboration entails the provision of advanced data analytics software to integrate and process diverse data sources, including open-source intelligence and satellite imagery, map command chains within the Russian force, identify satellite images, and search for individuals. The software facilitates the construction of a comprehensive virtual map of war crimes evidence, aiding in establishing the proximity of Russian military equipment to crime scenes and corroborating witness statements.⁵³

51. Bart Custers, *AI in Criminal Law: An Overview of AI Applications in Substantive and Procedural Criminal Law*, in *LAW AND ARTIFICIAL INTELLIGENCE: REGULATING AI AND APPLYING AI IN LEGAL PRACTICE* 205, 216 (Bart Custers & Eduard Fosch-Villaronga eds., 2022).

52. Nema Milaninia, *Biases in Machine Learning Models and Big Data Analytics: The International Criminal and Humanitarian Law Implications*, 102 *INTERNATIONAL REVIEW OF THE RED CROSS* 199, 226 (2020).

53. Lisa Gordon, *Palantir to Support Ukrainian Prosecutor-General's Investigation into War Crimes* (Apr. 24, 2024), <https://investors.palantir.com/news-details/2023/Palantir-to-Support-Ukrainian-Prosecutor-Generals-Investigation-into-War-Crimes/>; Jeffrey Dastin, *Data company Palantir to help Ukraine prosecute alleged Russian war crimes* (Apr. 22, 2023), <https://www.reuters.com/world/europe/data-company-palantir-help-ukraine-prosecute-alleged-russian-war-crimes-2023-04-22/>.

The International, Impartial and Independent Mechanism for Syria has employed ML to manage and analyze extensive evidence of war crimes. As it has been reported:

The technology is aimed at helping process, organize and analyze the data and reduce the time human investigators spend sifting through terabytes of traumatic videos and images. AI algorithms help group videos of the same incident and weed out duplicates or unrelated images. Algorithms are also working on object recognition, finding all data relevant to a specific weapon to help build a case.⁵⁴

These technologies assist in sorting through vast amounts of data, identifying patterns, and establishing connections crucial for building international crimes cases.

A recent Eurojust report also underscores the potential of AI for patterns analysis: “A wide range of NLP [natural language processing] techniques, information extraction techniques in combination with relation extraction and network analysis can help identify relationships between certain companies, individuals or other named entities across large amounts of data.”⁵⁵ To give some examples: NLP can extract keywords like “shelling of hospitals,” “mass executions,” or “targeting of civilians” from documents. Information extraction techniques such as named entity recognition identify key entities (e.g., people, locations, and organizations) in large datasets. Relation extraction could help identify relationships between entities, such as who committed what crime, where, and when. And network analysis helps investigators map connections between individuals, locations, events, and organizations.⁵⁶ Finally, AI-powered geo-mapping tools can track attack locations over time, proving a deliberate and organized pattern.

These techniques, applied to data such as phone call data and records of physical meetings, could also help understand and map command structures and military organizations, including for the purpose of identifying leaders.

54. Abdulrahim Raja, *AI Emerges as Crucial Tool for Groups Seeking Justice for Syria War Crimes*, WALL STREET JOURNAL (Feb. 13, 2021), <https://www.wsj.com/articles/ai-emerges-as-crucial-tool-for-groups-seeking-justice-for-syria-war-crimes-11613228401>.

55. *Supra* note 49.

56. Jennifer A. Johnson et al., *Social Network Analysis: A Systematic Approach for Investigating*, FBI LAW ENFORCEMENT BULLETIN (Mar. 5, 2013), <https://leb.fbi.gov/articles/featured-articles/social-network-analysis-a-systematic-approach-for-investigating>.

However, while AI methods such as named entity recognition, relation extraction, and network analysis offer significant promise in uncovering patterns of crimes and establishing linkages between high-level perpetrators and crimes, they are not without limitations. For example, named entity recognition can suffer from data bias, due to, for example, lack of or underrepresentation of certain dialects in the datasets that can reduce the system's accuracy when dialects are used. Relation extraction is prone to errors due to veiled language, coded expressions, or inaccurate testimonies, while network analysis could for similar reasons mistakenly detect associations among people networks.⁵⁷ These limitations in terms of accuracy, together with the lack of explainability of many AI techniques, should be understood and addressed, including through training, before employing these AI techniques in international crime investigations.⁵⁸

D. Conclusion: Implications of AI in Fact Finding for Prosecutorial Duties and Defence Rights

In conclusion, tools such as facial and speech recognition and AI-driven patterns analysis hold potential for increasing the effectiveness and completeness of investigations. However, they carry risks in terms of misidentifications, misinterpretation (including faulty correlations), and overlooking of key information and potential evidence. These risks can have far reaching implications for prosecutorial duties and defense rights.

On the one hand, errors arising from AI, such as misidentifications, misinterpretations, and failures to detect, could result in the prosecutor failing to comply with his core obligations under Article 54 of the Rome Statute. Under this provision, the prosecutor has an obligation “to establish the truth” and “extend the investigation to cover *all facts and evidence* relevant to an assessment of whether there is criminal responsibility under this Statute”

57. On challenges and future perspectives on techniques for identifying crime leaders, see Kamal Taha et al., *Unlocking Criminal Hierarchies: A Survey, Experimental, and Comparative Exploration of Techniques for Identifying Leaders Within Criminal Networks*, SEMANTIC SCHOLAR (Jan. 26, 2024), <<https://api.semanticscholar.org/CorpusID:267500349>.

58. For a comprehensive analysis of the limitations of named entity recognition, relation extraction, and network analysis in the context of crime pattern analysis, see Kiran Adnan & Rehan Akbar, *Limitations of Information Extraction Methods and Techniques for Heterogeneous Unstructured Big Data*, INTERNATIONAL JOURNAL OF ENGINEERING BUSINESS MANAGEMENT (Dec. 9, 2019), <https://journals.sagepub.com/doi/full/10.1177/1847979019890771>.

and to “investigate incriminating and *exonerating* circumstances equally.”⁵⁹ This key principle, rooted in the ICC hybrid procedural framework that draws from both civil law and common law traditions, seeks to mitigate the inherent advantageous position that the OTP has at the start of investigations, given that “[d]efence teams start investigating the case with significantly less information, time, and resources as compared to the OTP.”⁶⁰ This is a duty to carry out reliable and complete investigation before the confirmation of charges hearing.⁶¹

The integration of AI into fact-finding may amplify the risk of biased investigations (already an issue in international criminal trials).⁶² Notably, given the opacity and complexity of many AI systems, it may be extremely difficult for users, such as investigators, to detect when an AI tool has contributed to a failure to uncover exculpatory evidence or has produced a misidentification or misinterpretation (e.g., of a face or voice). Moreover, these errors may not immediately amount to a violation of the prosecutor’s disclosure obligations under Article 67(2), which require the timely disclosure of any material potentially favorable to the defense. As such, even if detected, they may not trigger procedural consequences such as judicial orders to disclose, or disciplinary actions. Nonetheless, failures to pursue exonerating evidence or to investigate all relevant facts—including errors stemming from an overreliance on flawed recommendations from AI tools—may be taken into account by the Pre-Trial Chamber in assessing whether there are sufficient grounds to confirm charges under Article 61(7).⁶³ In the absence of transparency about the AI tools used by the prosecution and their functioning and limitations, it would be challenging for the defense to submit a complaint about the prosecution’s failure to satisfy obligations under Article 54(1), particularly failures to investigate exonerating circumstances. Some procedural safeguards to mitigate these risks could be the adoption of disclosure protocols by the prosecutor and independent audits of AI tools used by the OTP.

59. Rome Statute of the International Criminal Court, *supra* note 19, art. 54(1)(a) (emphasis added).

60. Rome Statute of the International Criminal Court, *supra* note 19, art. 67; *see also* María De Arcos Tejerizo, *Digital Evidence and Fair Trial Rights at the International Criminal Court*, 36 LEIDEN JOURNAL OF INTERNATIONAL LAW 749 (2023).

61. Caroline Buisman, *The Prosecutor’s Obligation to Investigate Incriminating and Exonerating Circumstances Equally: Illusion or Reality?*, 27 LEIDEN JOURNAL OF INTERNATIONAL LAW 205 (2014).

62. *Id.* at 214.

63. *Id.* at 220.

On the other hand, one question that arises is whether the use of AI tools on the part of the prosecutor might violate the principle of equality of arms.⁶⁴ The question of adequate facilities for the preparation of the defense has been one of the most vexed and includes “obligations of covering the financial resources to pay a defence team, as well as other logistical and technical resources.”⁶⁵ The ICC and other international courts have recognized that defense teams must have adequate resources to challenge the prosecution’s case. While this does not entail an absolute right to identical tools, including technological tools, AI-powered tools (e.g., for analysis of videos or open-source information, or deepfake detection) might significantly impact case outcomes, and denying them to the defense may undermine the fairness of the proceedings. In the domestic context, concerns about due process and the respect for adversarial proceedings have, for instance, emerged in relation to the Italian Court of Cassazione’s reference to facial recognition results to support a public prosecutor’s request for a pre-trial detention measure.⁶⁶ Legal and regulatory approaches are and will continue to be developed within national contexts. It is therefore important to monitor national developments in judicial and regulatory approaches to the use of facial recognition technology—and, more generally, AI-generated evidence—in order to draw insights for the development of approaches in the ICC context.⁶⁷

IV. AI SUPPORTING TRIAL PHASE-RELATED TASKS

64. Rome Statute of the International Criminal Court, *supra* note 19, art. 67; *see also* De Arcos Tejerizo, *supra* note 60.

65. Yvonne McDermott, *The Right to a Fair Trial in Practice in International Criminal Trials*, in FAIRNESS IN INTERNATIONAL CRIMINAL TRIALS 41, 93 (Yvonne McDermott ed., 2016).

66. Alice Giannini, Federica Genovesi Mignon van der Westhuizen Serena Zanirato, *Building a litigation strategy to challenge the use of facial recognition technologies by law enforcement and judicial authorities in Italy* (Executive summary). StraLi – For Strategic Litigation. (2024, December), https://www.strali.org/wp-content/uploads/2024/12/Report_1.pdf

67. *See for instance* a comparative study of regulatory frameworks for facial recognition technology in criminal justice systems across the United States, Canada, Italy, Germany and France, Pedro Robles et al., *Global Perspectives on Regulating Facial Recognition Technology Utilization for Criminal-Justice Arrests*, 5 GLOBAL PUBLIC POLICY AND GOVERNANCE 186, 186–204 (2025).

While the preceding part focused on the role of AI in fact-finding and evidence collection, AI's potential extends beyond the investigations phase. This part examines three key applications of AI during trial proceedings, considering the distinct challenges of international criminal trials, such as multilingual proceedings and the vast volume of witness testimonies. In this context, AI can play a crucial role in translation, summarization,⁶⁸ and cross-checking testimonies, facilitating more efficient case preparation, judicial deliberations, and the drafting of judgments.

Although this article does not focus on AI applications in legal research and pleadings, those areas also present opportunities for AI use and need to be explored.

A. Translation

One of the most common issues in international criminal proceedings is communication across multiple languages and the analysis of evidence in different languages. This is a critical feature of international criminal trials, particularly at institutions such as the ICC, where, on the one hand, the working languages are often different from the mother tongues of staff members and, moreover, witnesses often come from diverse cultural backgrounds and speak languages that differ from those of the prosecutors, judges, and, frequently, the defense counsel. In contrast to proceedings for ordinary crimes, international criminal trials are inherently more heterogeneous, both culturally and linguistically.

Translation plays a central role in these proceedings, as large volumes of speeches and materials often need to be translated. Furthermore, translation serves as a crucial intermediary between witnesses, victims, suspects, defense counsel, the OTP, and judges.

First, in relation to interpretation and translation during trial proceedings, AI, particularly speech-to-text and machine translation systems, holds significant potential, especially for real time interpretation of witness testimonies, drafting of transcripts, and translation of legal documents such as declarations and witness statements.

68. Matt Halling, *Artificial Intelligence and International Criminal Law*, EJIL:TALK (June 14, 2023), <https://www.ejiltalk.org/artificial-intelligence-and-international-criminal-law/>.

Second, AI can play a crucial yet often overlooked role in field interpretation in international criminal trials, particularly in conflict zones where evidence is gathered.⁶⁹ Field interpretation refers to on-the-ground language interpretation, often in conflict zones or locations where evidence is being gathered. This type of interpretation plays a crucial role in ensuring that witnesses, victims, investigators, and legal representatives can communicate effectively, often with the aim of drafting witness and victim statements. However, many field interpreters lack professional training and often overlook the critical needs of accuracy and completeness. Also, issues of neutrality, confidentiality, and impartiality often arise.⁷⁰ Additionally, the process of gathering witness statements is fraught with problems, due to multiple back-to-back translations in different languages, leading to procedural challenges in gathering statements.⁷¹

AI-driven tools could help streamline this process by improving real-time interpretation, reducing associated risks, confidentiality breaches, and impartiality concerns. Furthermore, AI-assisted interpretation could help mitigate the effects of trauma, stress, and fatigue experienced by interpreters, ultimately enhancing the accuracy and reliability of witness statements.

While AI-driven tools offer considerable potential for improving field interpretation, some aspects of their application require careful attention. One important issue is the translation of less common languages and colloquial expressions. AI may fail to capture the complexities inherent in less commonly spoken languages and slang because of limited training datasets. Moreover, the meaning of speech or text is highly context-dependent,⁷² and

69. Although this primarily concerns the investigation phase, it will be treated here under the topic of translation.

70. Nancy Schweda Nicholson, *Interpreting at the International Criminal Tribunal for the Former Yugoslavia (ICTY): Linguistic and cultural challenges* in THE TRANSLATOR AS MEDIATOR OF CULTURES 40 (Humphrey Tonkin and Maria Esposito Frank eds., 2010).

71. For example, at the ICTY investigators composed witness statements in English based on interpreted exchanges, which were then reinterpreted for the witness to confirm accuracy before signing. In courts like the Special Court for Sierra Leone, the process was even more complex when witnesses spoke vernacular languages. Statements had to be translated multiple times—first into a lingua franca (e.g., Krio), then into English—before being transcribed and verified, often requiring back-translation for witness confirmation, Tim Kelsall, *Culture under Cross-Examination: International Justice and the Special Court for Sierra Leone*, (CUP 2009), 217 and 218.

72.

What makes interpretation so difficult is that it is useless to translate words into their literal equivalents because people do not communicate only by the strict denotative meanings of

machine translation systems are limited in their ability to determine the appropriate context.

AI systems must be specifically trained to recognize and interpret these varying registers. Additionally, the historical and social context must be taken into account. Without incorporating these elements into machine learning models, AI-driven translations may fail to capture the full meaning of statements, leading to inaccuracies.

Addressing the limitations of AI and machine translation is crucial to safeguarding the right to translation and interpretation in international criminal trials, as these rights are fundamental to ensuring due process. The protection of language rights has been widely recognized by scholars as a pivotal factor in determining whether international trials can meet fairness standards. Ensuring the accuracy and reliability of AI tools for translation and interpretation mechanisms with the use of AI is essential for upholding the right to a fair trial in the proceedings.⁷³

B. *Summaries and Cross-Referencing Testimonies and Evidence*

Given the vast volume of evidence and particularly witness testimonies, summaries play a crucial role. Summaries of evidence, including witness testimonies, enhance both examination and cross-examination. In the judgment drafting phase, they are essential. As affirmed by Marko Oberg:

words. Ideally, all interpretation aims to achieve an “integral communication of meaning” that centers on ideas expressed rather than individual words uttered. Specifically, an interpreter must reformulate source utterances into their experiential, contextual, and phenomenological equivalents in the target language, doing his or her best to preserve the import of the speaker’s words, phrases, colloquial expressions, gestures, and the like.

Joshua Karton, *Lost in Translation: International Criminal Tribunals and the Legal Implications of Interpreted Testimony*, 41 VAND. J. TRANSNAT’L L. 1, 26 (2008).

73.

As well as having the right to be informed of the charges against them in a language that they understand, accused persons before international criminal tribunals have the right to free assistance of an interpreter, if they cannot understand or speak the language used by the tribunal. The ICC’s provision expands on this right, by stating that the accused is entitled to an interpreter if he or she does not “fully” understand or speak the language of proceedings.

McDermott, *supra* note 65, at 66–67 (footnote omitted).

By drafting, from the outset of the trial, a series of high-quality witness summaries, the Trial Chamber creates and maintains a reliable restatement of the evidence that greatly facilitates and accelerates the judicial analysis. It can use them to form the backbone of the judgment. For each question to be determined, relevant parts of summaries can be compared and analysed without drowning in the sheer volume of evidence.⁷⁴

AI-based summarization solutions can assist in managing large volumes of textual information, such as hundreds of testimonies. However, several studies indicate that automated summarization cannot match human performance in grasping context and nuance, offering only a high-level overview and quick understanding of document content.⁷⁵ This, in turn, makes the information more accessible for in-depth human analysis. In a recent study, Hongtao Zhao confirms these concerns despite recent advancements: “Whether it’s extractive or generative summarization, advancements in summarization models depend on gaining a deeper understanding of the text. This is particularly relevant in the realm of legal text summarization research.”⁷⁶ Zhao calls for further research in the field of legal document summarization. The risks of inaccurate summarization are substantial in international criminal proceedings, potentially resulting in the omission of key information in judgments or missing inconsistencies. Therefore, human verification and analysis remain essential.⁷⁷

Finally, AI could help identify inconsistencies among witness testimonies, statements, and evidence. This could support the OTP, defense, and victims’ representatives in formulating questions during direct- and cross-

74. Marko Divac Öberg, *Processing Evidence and Drafting Judgments in International Criminal Trial Chambers*, 24 CRIMINAL LAW FORUM 113, 143 (2013).

75. Ani Nenkova & Kathleen McKeown, *A Survey of Text Summarization Techniques*, in MINING TEXT DATA 14 (Charu C. Aggarwal & ChengXiang Zhai eds., 2012).

76. Hongtao Zhao, *Overview of Judicial Text Summarization Method*, 85 HIGHLIGHTS IN SCIENCE, ENGINEERING AND TECHNOLOGY 945 (2024).

77.

[D]ocumentation used for evidence will need to go through human verification and analysis and the users need to be aware of not rely [sic] on the output of the system only. Although significant advances have been made over the past two decades in developing text summarisation systems, today there are no one-size-fits-all solutions, as systems trained on generic text corpus will not be suitable for processing specialist text.

EU-LISA & EUROJUST, *supra* note 49, at 19.

examination. AI can also suggest pertinent questions for judges to pose during proceedings (in accordance with Article 64 of the ICC Statute). By cross-verifying information, AI can corroborate aspects of testimonies with other pieces of evidence, strengthening the credibility of witnesses. Similarly, the methods AI uses to detect inconsistencies or provide corroboration could serve as a deliberation support tool in the judgment drafting phase. To the best of my knowledge, these uses remain underexplored and deserve further examination.

V. CONCLUSIONS AND RECOMMENDATIONS

This article sought to examine the role of AI in the prosecution of international crimes before the ICC. It has sought to map AI's applications in these proceedings against the backdrop of the landscape of AI integration in national criminal justice systems, ongoing developments in AI technology, and available information from relevant stakeholders. In doing so, it has explored AI's potential contributions to fact-finding and to trial proceedings, as well as the associated risks and implications for the prosecutors' obligations, defense rights, and judges' and legal officers' responsibility.

A first takeaway from this article is that, both at present and in the near future, AI integration in international criminal proceedings is primarily aimed at assisting investigators and judges with specific *tasks* rather than replacing judicial decision-making.⁷⁸ This is because international criminal proceedings are fundamentally more complex than national criminal proceedings. In domestic contexts, judges often face an overwhelming volume of relatively straightforward decisions—such as rulings on provisional release—where AI could to some extent supplant decision-making. However, even in those cases, risks such as data bias remain significant. By contrast, international

78.

The authors noted that the work of AI at the current stage is possible exclusively in conjunction with a human judge, similar to a co-robot (collaborative robot controlled by a person). We are talking about the combined work of AI in tandem with a human judge or under control in the field of legal-machine processing and evaluation of evidence as information about the facts on which the parties justify their position in court.

Vasiliy A. Laptev & Daria R. Feyzrakhmanova, *Application of Artificial Intelligence in Justice: Current Trends and Future Prospects*, 4 HUMAN-CENTRIC INTELLIGENT SYSTEMS 394, 403 (2024).

criminal proceedings typically involve the processing of vast amounts of materials and evidence in order to prove contextual elements and linkage evidence. This makes the role of AI more focused on enhancing the efficiency of evidentiary review rather than automating judicial decision-making.

Moreover, embedding criminal law standards for decision-making into AI systems presents significant challenges, technical and legal. For instance, encoding the principle of “beyond reasonable doubt”⁷⁹ would first require unpacking its legal nuances—already subject to ongoing interpretative debate.⁸⁰

Second, technology is, however, never just a supporting tool. Framing AI in international criminal proceedings within a *functional paradigm*—that is, as a tool designed to support specific tasks—requires a granular understanding of how it affects users’ decision-making and cognitive processes.⁸¹ To this end, a certain degree of explainability of AI tools must be ensured. This refers to users having an understanding of “the workings of an algorithm” that allow those users to “make predictions or deductions as to how it will behave or why it did behave in a certain way.”⁸² This is essential to avoid false positives or false negatives leading to misidentification of victims or suspects in evidentiary material, the overlooking of exculpatory circumstances, or ultimately, flawed interpretations and assessments of evidence. To the same end, it is crucial to recognize the risk of cognitive bias, particularly automation bias, that may affect human cognitive processes. For example, it is widely acknowledged that when AI-based analyses are perceived as highly reliable, users have a tendency to overt trust their outputs without

79. Rome Statute of the International Criminal Court, *supra* note 19, art. 66.

80. Simon De Smet, *The International Criminal Standard of Proof at the ICC—Beyond Reasonable Doubt or Beyond Reason?*, in *THE LAW AND PRACTICE OF THE INTERNATIONAL CRIMINAL COURT* 861 (Carsten Stahn ed., 2015); Yvonne McDermott, *The ICTR’s Fact-Finding Legacy: Lessons for the Future of Proof in International Criminal Trials*, 26 *CRIMINAL LAW FORUM* 351 (2015).

81. See also Francesco Contini, *Artificial Intelligence and the Transformation of Humans, Law and Technology Interactions in Judicial Proceedings*, 2 *LAW, TECHNOLOGY AND HUMANS* 4 (2020); Ammar Zafar, *Balancing the Scale: Navigating Ethical and Practical Challenges of Artificial Intelligence (AI) Integration in Legal Practices*, *DISCOVER ARTIFICIAL INTELLIGENCE* (Apr. 15, 2024), <https://doi.org/10.1007/s44163-024-00121-8>.

82. Jonathan Kwik & Tom van Engers, *Performance or Explainability? A Law of Armed Conflict Perspective*, in *ARTIFICIAL INTELLIGENCE AND NORMATIVE CHALLENGES: INTERNATIONAL AND COMPARATIVE LEGAL PERSPECTIVES* 255, 259 (A. Kornilakis et al. eds., 2023).

critically questioning them, even when presented with contradictory information.⁸³ The limitations posed by the lack of explainability in many AI techniques, as well as the associated risks of cognitive bias, should be acknowledged and mitigated—particularly through the training of ICC staff—before such techniques are employed in international criminal investigations and proceedings.

Third, a key concern to account for in the exploration of AI uses in international criminal proceedings is the issue of bias. International criminal proceedings are inherently shaped by initial biases against suspects, as multiple actors—such as news agencies, NGOs, UN agencies, and fact-finding commissions—may be involved in documenting human rights violations even before a situation is referred to the ICC or formally opened by the chambers.⁸⁴ These early-stage biases can have far-reaching implications. First, cognitive biases among investigators, prosecutors, legal officers, and judges could be further exacerbated by automation bias. Second and critically, early-stage biases could lead to data bias, which occurs when “data sets used to train ML models over- or under-represent certain groups or events.”⁸⁵ A key instance is the over-reporting or under-reporting of incidents that may lead to “reporting bias,” which refers to “the lack of representativeness in the available data.”⁸⁶ A hypothetical example put forward by Nema Milaninia refers to OTP investigators creating an ML model to determine which crimes to prioritize in the Afghanistan investigation based on user generated content, such as social media posts. Investigative decisions based on such a model could be biased in light of social (who has access to the internet) and linguistic (who can produce online content in English) bias that impacts online content. Another example he offers is an “ML model

83. Marta Bo & Jessica Dorsey, *The ‘Need’ for Speed—The Cost of Unregulated AI Decision-Support Systems to Civilians*, OPINIOJURIS (Apr. 4, 2024), <https://opiniojuris.org/2024/04/04/symposium-on-military-ai-and-the-law-of-armed-conflict-the-need-for-speed-the-cost-of-unregulated-ai-decision-support-systems-to-civilians/>; Harry Davies et al., *The Gospel: How Israel Uses AI to Select Bombing Targets*, THE GUARDIAN (Dec. 1, 2023), <https://www.theguardian.com/world/2023/dec/01/the-gospel-how-israel-uses-ai-to-select-bombing-targets> (interview with Marta Bo); Jonah Hull, *What Are the Implications of Israel’s Reported Use of AI in Gaza War?*, AL JAZEERA (Dec. 3, 2023), <https://www.aljazeera.com/program/inside-story/2023/12/3/what-are-the-implications-of-israels-reported-use-of-ai-in-gaza-war> (interview with Jessica Dorsey).

84. De Arcos Tejerizo, *supra* note 60, at 754; Milaninia, *supra* note 52, at 205.

85. Milaninia, *supra* note 52, at 203–16. Laura Bruun & Marta Bo, *Bias in Military Artificial Intelligence and Compliance with International Humanitarian Law*, (SIPRI August 2025), https://www.sipri.org/sites/default/files/2025-08/0825_ai_military_bias.pdf.

86. Milaninia, *supra* note 52, at 209.

designed to identify crime patterns or patterns in attacks by insurgents which could, based on reporting biases in the data set, generate misleading results as to how common the crimes or attacks are, or their shared characteristics.”⁸⁷ Due to reporting bias in the training data, such a model could erroneously suggest that violence is concentrated in urban areas simply because killings in these areas are more consistently documented than those in rural regions. Similarly, some types of crimes—such as sexual and gender-based violence—are often underreported, which can distort datasets and impact the completeness of investigations, including pattern of crimes.⁸⁸ Ultimately, recognizing and mitigating bias is crucial to ensuring the fairness and reliability of the use of AI-driven tools in international criminal proceedings. This is particularly challenging given that the ICC operates across diverse countries, each with its own legal, cultural, and linguistic specificities. These differences require AI systems that are tailored to specific situation countries rather than applying a one-size-fits-all system.⁸⁹ Moreover, the fact that the ICC often works in the context of ongoing armed conflict can further impair data quality and availability—posing additional obstacles to development.

Related to the training of AI systems, confidentiality is a critical concern when utilizing AI in international criminal proceedings, particularly regarding sensitive data such as witness statements and testimonies used to train or prompt AI tools. The fairness of international criminal proceedings hinges on the protection of such information, and any breach could compromise the safety of witnesses and the fairness of trials with a risk of third parties garnering confidential information. Appropriate consideration of this issue should therefore be given.

Finally, we turn to the way forward. In considering the future integration of AI in international criminal proceedings, it is imperative to address the role of AI as evidence. For example, one pertinent scenario could be the introduction of AI-driven facial and voice recognition analyses as evidence of an individual identification.⁹⁰ In such instances, the use of AI in trials ne-

87. *Id.* at 212.

88. *Id.* at 209–13.

89. Arowosegbe, *supra* note 17.

90. See Gabrielle M. Haddad, *Confronting the Biased Algorithm: The Danger of Admitting Facial Recognition Technology Results in the Courtroom*, 23 VANDERBILT JOURNAL OF ENTERTAINMENT & TECHNOLOGY LAW 891 (2021).

cessitates the involvement of expert witnesses who can elucidate the functioning and reliability of these tools.⁹¹ As part of their due process rights, defendants need to be able to contest evidence from facial recognition systems. However, the opacity of AI systems, often referred to as the “black box” issue, and the associated difficulties in scrutinizing and tracing back AI outputs would complicate defendants’ challenges to facial and speech recognition systems as well as their cross-examination of expert witnesses.⁹²

As a short-term measure for the ICC, it should consider scenarios where AI functions as evidentiary material and address how it will guarantee due process rights considering interpretable algorithms, explainable AI (XAI), and black box issues.⁹³ As mid-term measure, the establishment of comprehensive standards for the admissibility of AI-generated evidence should be considered.

Long-term measures must be considered in relation to “device evidence,”⁹⁴ or evidence that originates from electronic or digital technology.⁹⁵ The integration of AI into battlefield operations continues to expand,⁹⁶ be it in autonomous weapons systems or AI-decision support systems and IHL has begun to grapple with these systems. With this, the likelihood of war crimes or other international crimes committed with the use of AI on the battlefield increases.⁹⁷ Such cases would raise questions about the admissibility and reliability of AI-derived or “device evidence.”⁹⁸ As a long-term meas-

91. Matthew Gillett & Wallace Fan, *Expert Evidence and Digital Open Source Information*, 21 JOURNAL OF INTERNATIONAL CRIMINAL JUSTICE 661 (2023).

92. Rome Statute of the International Criminal Court, *supra* note 19, art. 67(1)(e).

93. Eugenio Zuccarelli, *Building Trust in AI Means Moving Beyond Black-Box Algorithms. Here's Why*, WORLD ECONOMIC FORUM (Apr. 2, 2024), <https://www.weforum.org/stories/2024/04/building-trust-in-ai-means-moving-beyond-black-box-algorithms-heres-why/>.

94. Sabine Gless *et al.*, *AI-Based Evidence in Criminal Trials?*, 59 TUSLA LAW REVIEW 1 (2024), at 4.

95. *Supra* note 4.

96. Jessica Dorsey & Marta Bo, *AI-Enabled Decision-Support Systems in the Joint Targeting Cycle: Legal Challenges, Risks, and the Human(e) Dimension*, 106 INTERNATIONAL LAW STUDIES — (2025).

97. Marta Bo, *Netanyahu and Gallant ICC Arrest Warrants: Tackling Modern Warfare and Criminal Responsibility for AI-Enabled War Crimes*, OPINIOJURIS (Dec. 4, 2024), <https://opiniojuris.org/2024/12/06/netanyahu-and-gallant-icc-arrest-warrants-tackling-modern-warfare-and-criminal-responsibility-for-ai-enabled-war-crimes/>.

98. Gless *et al.*, *supra* note 94.

ure, international criminal law legal frameworks must address issues of accessibility,⁹⁹ verification,¹⁰⁰ accuracy, and reliability of AI-generated evidence, including that stemming from use of AI devices on the battlefield.

99. Given the secrecy around military AI systems, access to such evidence may be restricted, complicating efforts to ascribe responsibility. Laura Bruun, *Investigating (Mis)conduct in War is Already Difficult: Will the Use of Military AI Make it Harder?*, JUST SECURITY (Jan. 5, 2023), <https://www.justsecurity.org/84655/investigating-misconduct-in-war-is-already-difficult-will-the-use-of-military-ai-make-it-harder/>.

100. Freeman, *supra* note 10, at 50–52.