

# Adequacy of AI techniques for Digital Forensic tasks

Nicolás Madrid

University of Cádiz (Spain)  
Dept. of Mathematics  
nicolas.madrid@uca.es

## Extended Abstract

Artificial intelligence (AI) is a disruptive technology whose implementation is exponentially increasing and directly affecting society in multiple dimensions, some of them appalling. Actually, in the last years, the indiscriminate use of AI system for different purposes has raised concerns about its potential impact on fundamental rights. For instance, we can mention the proved relationships between the AI based recommendation systems in social networks and the suicide of teenagers [9]. Another example is the case of the SyRI algorithm aimed at detecting social welfare fraud. In 2020 the Rechbank Den Haag declared illegal the use of the SyRI algorithm used by the governmental body of the Netherlands because, among other things, it violates Article 8 of the European Convention on Human Rights (ECHR), which protects the right to respect private and family life, home, and correspondence [11].

This talk analyses the use of AI techniques in criminal matters, which can be also affected by the terrible repercussions of using AI. For example, the algorithm COMPAS (Correctional Offender Management Profiling for Alternative Sanctions) was used by several US states as a recommendation system that measures the recidivist of criminals. COMPAS was found to be racist in their recommendations showing significant disparity of errors among different races [2]. We put our focus on digital forensic analysis [12], which main purpose is to present admissible digital evidences to courts, which requires that the evidence has to be collected, examined, and analysed using both technically and legally acceptable methods and tools. The use of AI has proved to be fruitful in the field of digital forensics to analyse evidences and obtain information from them [3, 8, 10].

Perhaps, the lack of binding regulation for the use of AI (in particular, in EU and in criminal investigations) has avoided the attention of AI researchers to significant legislative and ethical aspects. However, AI systems are also subject to legislations depending on their application. In particular, the methods and tools used to obtain evidences must always be subject to exhaustive control in order to safeguard the fundamental rights of a fair trial, presumption of innocence and right to defense, especially if new technologies are introduced for this purpose. AI researchers interested in digital forensics should be aware that, in principle, although an AI system could produce accurate results, those results might not be adequate from a legal point of view, and thus not be admissible in courts of

law in a criminal proceeding. Actually, the impact of using an AI system may be terrible in a criminal investigation if it is proved that it infringes one fundamental right, since not only the evidences obtained from the AI system may be considered non-admissible in a court but also all the evidences collected later on, which may ruin completely a criminal investigation.

The proposal of the Artificial Intelligence Act [4] is necessary but not sufficient to cover the needs and guarantees of the use of this technology in criminal investigation processes. Its regulatory development is too generic, and only a few articles collect the obligations and requirements of public or institutional entities in the use of AI. Another relevant legal document emanating from the European Union on criminal investigation and AI is the Resolution of the European Parliament of 6th October 2021 [7]. Although this resolution has a non-binding nature, which means that member states are not obliged to comply with its content, it highlights the main problems observed by the EU body on the use of AI by law enforcement and judicial authorities in criminal matters. Specifically, the resolution states that the development, distribution, and use of AI can facilitate functions, but they also run the risk of colliding with rights, including fundamental rights. The following 12 fundamental rights enshrined in the Charter of Fundamental Rights [1] of the European Union can be potentially affected by the use of AI in society according to [4] and [7]:

ARTICLES ON THE CHARTER OF FUNDAMENTAL RIGHTS OF THE EUROPEAN UNION	{	<table style="border-collapse: collapse;"> <tr> <td style="padding-right: 10px;"><i>DIGNITY</i></td> <td style="font-size: 2em; vertical-align: middle;">{</td> <td style="padding-left: 10px;">1. Human Dignity. 7. Respect for private and family life. 8. Protection of personal data.</td> </tr> <tr> <td style="padding-right: 10px;"><i>FREEDOMS</i></td> <td style="font-size: 2em; vertical-align: middle;">{</td> <td style="padding-left: 10px;">11. Freedom of expression and information. 12. Freedom of assembly and of association.</td> </tr> <tr> <td style="padding-right: 10px;"><i>EQUALITY</i></td> <td style="font-size: 2em; vertical-align: middle;">{</td> <td style="padding-left: 10px;">21. No-discrimination. 23. Equality between men and women. 24. The rights of the child.</td> </tr> <tr> <td style="padding-right: 10px;"><i>SOLIDARITY</i></td> <td style="font-size: 2em; vertical-align: middle;">{</td> <td style="padding-left: 10px;">31. Fair and just working conditions. 38. Consumer protection.</td> </tr> <tr> <td style="padding-right: 10px;"><i>EQUALITY</i></td> <td style="font-size: 2em; vertical-align: middle;">{</td> <td style="padding-left: 10px;">47. Right to an effective remedy and to a fair trial. 48. Presumption of innocence and right of defence.</td> </tr> </table>	<i>DIGNITY</i>	{	1. Human Dignity. 7. Respect for private and family life. 8. Protection of personal data.	<i>FREEDOMS</i>	{	11. Freedom of expression and information. 12. Freedom of assembly and of association.	<i>EQUALITY</i>	{	21. No-discrimination. 23. Equality between men and women. 24. The rights of the child.	<i>SOLIDARITY</i>	{	31. Fair and just working conditions. 38. Consumer protection.	<i>EQUALITY</i>	{	47. Right to an effective remedy and to a fair trial. 48. Presumption of innocence and right of defence.
<i>DIGNITY</i>	{	1. Human Dignity. 7. Respect for private and family life. 8. Protection of personal data.															
<i>FREEDOMS</i>	{	11. Freedom of expression and information. 12. Freedom of assembly and of association.															
<i>EQUALITY</i>	{	21. No-discrimination. 23. Equality between men and women. 24. The rights of the child.															
<i>SOLIDARITY</i>	{	31. Fair and just working conditions. 38. Consumer protection.															
<i>EQUALITY</i>	{	47. Right to an effective remedy and to a fair trial. 48. Presumption of innocence and right of defence.															

The intention of this talk is to provide a general overview of the use of AI in digital forensics from a legislative perspective. Studies in this direction are important from both a legislative and a technical point of view. On the one hand, it is important for legislators to carefully consider technical aspects when creating laws and regulations governing the use of AI in criminal investigations. On the other hand, it is important for researchers and developers specializing in artificial intelligence to be aware of the limits posed in the future by binding regulations during the development of AI techniques. We really think that there should be a symbiosis between legislators and AI researchers in order to ensure that the use of AI is ethical, effective, and consistent with the rule of law.

## References

1. *Charter of Fundamental Rights of the European Union*, volume 53. European Union, Brussels, 2010.
2. J. Angwin, J. Larson, M. S., and K. L. Machine bias: There's software used across the country to predict future criminals. and it's biased against blacks. *ProPublica*, 2016.
3. S. Costantini, G. De Gasperis, and R. Olivieri. Digital forensics and investigations meet artificial intelligence. *Annals of Mathematics and Artificial Intelligence*, 86(1):193–229, 2019.
4. European Commission. Proposal for a regulation of the european parliament and of the council laying down harmonised rules on artificial intelligence and amending certain union legislative acts.
5. European Parliament. General data protection regulation (gdpr).
6. European Parliament. Proposal for a regulation of the european parliament and the council on european production and preservation orders for electronics evidence in criminal matters.
7. European Parliament. Resolution on artificial intelligence in criminal law and its use by the police and judicial authorities in criminal matter.
8. A. Jarrett and K.-K. R. Choo. The impact of automation and artificial intelligence on digital forensics. *Wiley Interdisciplinary Reviews: Forensic Science*, 3(6):e1418, 2021.
9. D. Milmo. Pinterest executive admits platform 'not safe' when molly russell used it. *The Guardian*, 22.9.2022.
10. S. Raponi, G. Oligeri, and I. M. Ali. Sound of guns: digital forensics of gun audio samples meets artificial intelligence. *Multimedia tools and applications*, pages 1–26, 2022.
11. Rechtbank Den Haag. Syri legislation violates european convention on human rights, case number C-09-550982-HA ZA 18-388, available at: <https://deplink.rechtspraak.nl/uitspraak?id=ecli:nl:rbdha:2020:1878>.
12. M. Reith, C. Carr, and G. Gansch. An examination of digital forensic models. *International Journal of digital evidence*, 1(3):1–12, 2002.