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Research Article

Complex Thinking and Artificial Intelligence in Criminal Analysis: Epistemological Challenges for Contemporary Public Security

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Abstract

Artificial intelligence has become one of the most significant transformations in contemporary criminal analysis and public security. Its capacity to process large volumes of data, identify patterns, and support decision-making has generated broad institutional expectations, but also epistemological, ethical, and institutional challenges that exceed a purely technocratic perspective. This article examines these challenges from the standpoint of complex thinking. Methodologically, the study is based on a qualitative analytical documentary review of scientific literature, institutional documents, and regulatory frameworks published between 2018 and 2025, retrieved from Scopus, Web of Science, Google Scholar, and repositories of international organizations. The analysis was structured around six thematic axes: complexity and uncertainty, the algorithmic reduction of crime, structural bias, opacity and explainability, meaningful human oversight, and institutional governance. The findings show that artificial intelligence should not be understood as a substitute for human judgment or as a neutral predictive mechanism, but as a support tool whose legitimacy depends on data quality, contextual interpretation, meaningful human oversight, and ethical governance. It is concluded that complex thinking provides a critical, relational, and responsible framework for understanding algorithmic systems in public security.

Keywords

Complex Thinking, Artificial Intelligence, Criminal Analysis, Public Security, Algorithmic Governance, Epistemology

1. Introduction

Public security is undergoing a stage of profound transformation marked by the expansion of digital technologies, the accelerated growth of data, and the progressive incorporation of artificial intelligence systems into crime prevention, investigation, and criminal analysis processes. In this new scenario, institutions in charge of citizen security no longer depend exclusively on direct observation, operational experience, or traditional administrative records, but are beginning to integrate predictive analysis platforms, crime georeferencing systems, data mining, pattern recognition, intelligent surveillance, and automated decision-support models [1, 2].

This process has opened up relevant possibilities to improve institutional efficiency, optimize resource allocation, identify risk areas, detect recurring behaviors, and strengthen the State's anticipatory capacity in the face of increasingly dynamic criminal phenomena [3, 4]. However, it has also generated questions that go beyond

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the merely technical sphere. Artificial intelligence applied to criminal analysis does not operate in a social vacuum, but within institutional, normative, cultural, and political systems that condition both the production of data and the interpretation of results [5, 6].

One of the main epistemological problems lies in assuming that data speak for themselves or that algorithms offer an objective, neutral, and complete representation of criminal reality. Such an assumption is problematic because crime is not a linear phenomenon nor reducible to a sum of isolated variables. On the contrary, it constitutes a complex reality in which multiple dimensions interact: socioeconomic conditions, individual trajectories, territorial structures, family dynamics, illegal markets, social conflict, criminal opportunities, institutional responses, citizen perceptions, and changing forms of criminal organization [7, 8].

From this perspective, artificial intelligence can significantly contribute to criminal analysis, but it can also reproduce biases, amplify inequalities, reinforce patterns of selective surveillance, or produce apparently objective institutional decisions without sufficient contextual understanding [9-11]. Therefore, the problem is not limited to determining whether artificial intelligence is useful or not for public security, but to understanding under what epistemological, ethical, and institutional conditions it can be incorporated responsibly.

Although recent literature has examined artificial intelligence in public security from technical, legal, and ethical perspectives, there remains insufficient epistemological problematization regarding the assumptions of knowledge that guide its application to criminal analysis, particularly from approaches inspired by complex thinking. It is within this gap that the present study is situated.

Complex thinking, mainly developed by Edgar Morin, offers a relevant framework for addressing this discussion. Its contribution lies in questioning simplifying forms of knowledge, overcoming disciplinary fragmentation, and recognizing that human and social phenomena must be analyzed from interdependence, uncertainty, multidimensionality, recursivity, and the relationship between order, disorder, and organization [12, 13]. Applied to criminal analysis, this approach makes it possible to understand that criminality cannot be explained solely through statistical correlations or automated predictions, but requires interpretation, contextualization, and dialogue among forms of knowledge.

The objective of this article is to analyze the epistemological challenges posed by the application of artificial intelligence in criminal analysis from the framework of complex thinking. The central thesis holds that artificial intelligence can strengthen criminal analysis only if it is integrated within a model of complex understanding of criminal reality. This implies recognizing that algorithmic systems do not replace human reflection, do not eliminate uncertainty, and do not by themselves solve the structural problems of public security. Their value depends on data quality, institutional interpretation, human oversight, model transparency, ethical governance, and the capacity to articulate technical knowledge with social understanding.

The article is organized into six sections. Following this introduction, the problem statement and methodology are presented. Subsequently, the main documentary findings on the contemporary transformation of criminal analysis mediated by artificial intelligence are presented. Finally, these findings are discussed from the perspective of complex thinking, and the study's conclusions are offered.

2. Problem Statement

The application of artificial intelligence in criminal analysis has been presented in numerous contexts as an innovative response to the contemporary challenges of public security. Its capacity to process massive data, identify behavior patterns, classify risks, georeference incidents, and support operational decisions has generated strong expectations regarding its preventive potential [3, 4].

However, these expectations are often accompanied by an excessively instrumental vision, according to which the increase in data and algorithmic sophistication would suffice to understand and control the criminal phenomenon. This conception is limited because it tends to reduce criminality to a series of quantifiable records, leaving in the background the social, symbolic, territorial, institutional, and ethical dimensions involved in its production [5, 9].

Crime does not arise in isolation nor does it always respond to stable patterns. It is a phenomenon crossed by uncertainties, emergences, adaptations, conflicts, inequalities, human decisions, and institutional responses that continuously modify the very object of analysis [12, 13]. The problem becomes deeper when artificial intelligence systems are used as decision-support tools without sufficient reflection on their epistemological assumptions.

Every algorithmic model starts from a prior selection of data, variables, criteria, categories, and objectives. Therefore, its results are neither neutral nor purely technical, but constructions mediated by human decisions, institutional conditions, and interpretive frameworks [6, 10]. If these elements are not critically examined, there is a risk of turning criminal analysis into an automated, decontextualized, and apparently objective practice.

In addition, police data usually reflect not only the occurrence of crime, but also the way institutions record, classify, prioritize, and act upon certain territories and populations. This means that algorithmic systems can learn from previous institutional patterns and reproduce existing biases [8, 11]. Rather than objectively revealing criminal reality, they could amplify certain forms of surveillance, reinforce territorial stigmas, or concentrate police intervention in spaces historically overrepresented in the records.

From the perspective of complex thinking, this problem acquires particular relevance. Criminality cannot be understood as a simple, closed, and fully predictable object. It is a rela-

tional, dynamic, and multidetermined phenomenon that requires articulating quantitative information, qualitative interpretation, operational experience, territorial knowledge, institutional analysis, and ethical reflection [12, 13].

In this sense, the central question is not only how to apply artificial intelligence to criminal analysis, but how to prevent such application from excessively simplifying a reality that, by nature, is complex.

From the above, the research problem can be formulated as follows:

What are the main epistemological challenges that emerge from the application of artificial intelligence to criminal analysis, and in what way can complex thinking contribute to a more critical, contextualized, and responsible understanding of its use in contemporary public security?

3. Methodology

The present article was developed under a qualitative theoretical-documentary approach, oriented toward the critical analysis of the relationships between artificial intelligence, criminal analysis, and complex thinking in the contemporary context of public security. The research is grounded in a hermeneutic and interpretive perspective, since it seeks to understand the epistemological challenges that emerge from the use of algorithmic systems in institutional decision-making processes linked to crime prevention and analysis [14, 15].

3.1. Study Design

A critical analytical documentary review was adopted, structured in three phases: search, selection, and analysis. This design was appropriate for examining a problem of a conceptual, normative, and institutional nature, where technological, criminological, ethical, and epistemological dimensions converge.

3.2. Search Strategy

The documentary search was conducted between January and March 2026 in the databases Scopus, Web of Science, and Google Scholar, as well as in institutional repositories of international organizations linked to artificial intelligence and public security, including UNESCO, UNODC, OECD, the United Nations, and the European Commission.

Descriptors in Spanish and English were used, combined through Boolean operators, including:

1) “inteligencia artificial” AND “análisis criminal”
2) “artificial intelligence” AND “criminal analysis”
3) “predictive policing”
4) “algorithmic governance”
5) “algorithmic bias” AND policing
6) “complex thinking” AND security
7) “ethical AI” AND criminal justice

3.3. Selection Criteria

Documents that met the following criteria were included:

1) publication between 2018 and 2025, except for classic works indispensable to the theoretical framework;
2) direct relation to artificial intelligence, criminal analysis, predictive policing, algorithmic bias, algorithmic governance, technological ethics, or complex thinking;
3) origin from academic journals, university presses, reports by international organizations, or highly relevant normative documents;
4) availability of full text.

Duplicate works, opinion texts without academic support, publications not directly related to public security, or without conceptual relevance to the objective of the study were excluded.

3.4. Analysis Procedure

The analysis was carried out through a strategy of critical reading and thematic categorization [14]. From the selected corpus, six recurrent analytical cores were identified:

1) complexity and uncertainty;
2) algorithmic reduction of the criminal phenomenon;
3) structural bias;
4) opacity and explainability;
5) meaningful human oversight;
6) institutional governance.

These categories were subsequently articulated from the conceptual framework of complex thinking, with the purpose of constructing an integrative interpretation that would allow problematizing the epistemological limits of artificial intelligence applied to criminal analysis.

3.5. Scope of the Study

The research did not aim to technically evaluate specific algorithms or measure computational performance. Its purpose was to critically reflect on the epistemological, institutional, and ethical foundations underlying the use of artificial intelligence in contemporary public security. Consequently, the results should be interpreted as findings of a critical review oriented toward the theoretical understanding of the phenomenon, rather than as experimental validation of specific systems.

4. Results: Findings from the Documentary Review

4.1. The Digitalization of Public Security as an Epistemological Transformation

The review shows that the digitalization of public security is not merely a technical change, but a transformation in the way knowledge about crime is produced. Security institutions in-

creasingly resort to integrated databases, video surveillance, geolocation, data mining, and algorithmic decision-support systems [1, 2, 6]. This shift has favored a logic of "data-driven security," in which criminality begins to be interpreted through information flows, risk indicators, and mathematical patterns.

However, this process also introduces a tendency to privilege what is measurable and algorithmically processable, relegating human, contextual, and qualitative dimensions that remain essential for a comprehensive understanding of violence and criminality [5, 7]. In other words, digitalization transforms not only the instruments, but also the criteria by which what is relevant in public security is defined.

4.2. Predictive Crime Analysis and the Probabilistic Reduction of the Criminal Phenomenon

One of the most consistent findings is the central role of predictive policing in the expansion of artificial intelligence applied to public security. These systems seek to identify probabilities of criminal occurrence based on the analysis of historical patterns, spatial trends, and recurring behaviors [3, 4]. The literature reviewed agrees in recognizing operational advantages, such as faster information processing, territorial targeting, and resource optimization.

However, a fundamental epistemological limitation was also identified: the tendency to confuse correlation with causation [8, 11]. Algorithms can detect statistical regularities, but not necessarily understand the structural, institutional, or cultural conditions that produce crime. Thus, prediction may be operationally useful, but insufficient to explain the complexity of criminality.

4.3. Structural Bias and the Reproduction of Institutional Inequalities

The documentary review revealed a broad critical consensus regarding the risk that algorithmic systems reproduce biases contained in the historical data used to train them [8, 10, 11, 16]. In contexts where certain territories or groups have historically been more heavily surveilled, artificial intelligence systems may interpret such overrepresentation as objective evidence of greater dangerousness, reinforcing cycles of selective intervention.

This finding is especially relevant in criminal analysis, where institutional data reflect not only the occurrence of crime, but also prior decisions of surveillance, reporting, classification, and prioritization. Consequently, criminal data appear as a sociotechnical and institutional construction, not as a neutral mirror of reality.

4.4. Algorithmic Opacity and the Limits of Explainability

Another important finding is the persistence of tensions between analytical efficiency and transparency. The literature reviewed warns that many artificial intelligence systems operate as "black boxes," making it difficult to understand their internal criteria and limiting the possibility of institutional auditing or democratic oversight [6, 17, 18].

In public security, opacity is especially problematic because decisions assisted by algorithms can affect freedoms, rights, risk profiles, and surveillance priorities. The demand for explainable artificial intelligence does not respond only to a technical ideal, but to a condition of institutional legitimacy.

4.5. Meaningful Human Oversight as a Requirement of Legitimacy

The analysis identified a growing consensus regarding the need to maintain mechanisms of meaningful human oversight in the use of artificial intelligence applied to public security [17-20]. However, it is also warned that such oversight may be reduced to mere procedural validation if institutions assume algorithmic recommendations as objective truths.

The central finding here is that human intervention should not be limited to approving results, but to contextualizing them, interpreting them critically, and contrasting them with operational experience, territorial knowledge, and ethical criteria.

4.6. Algorithmic Governance and Institutional Capacity

Finally, the review showed that the legitimacy of artificial intelligence in public security depends less on its technical sophistication than on the quality of its institutional and normative integration [17, 19, 21]. Algorithmic governance thus appears as a central dimension, understood as the set of norms, procedures, responsibilities, and control mechanisms regulating the design, implementation, use, and oversight of algorithmic systems.

The reviewed documents agree that the absence of clear governance frameworks may favor opaque decisions, uncorrected biases, displacement of responsibility, and weakening of public trust. In this sense, institutional capacity to manage complexity, uncertainty, and accountability becomes an indispensable condition for the responsible use of these technologies.

5. Discussion

The findings confirm that artificial intelligence applied to criminal analysis cannot be understood as a neutral tool or as a simple technical extension of police capacity. Rather, it is configured as a sociotechnical device embedded in specific institutional, normative, and cultural contexts in which certain forms of knowledge, surveillance, and power are produced and reproduced [5, 6, 10].

From the perspective of complex thinking, the main prob-

lem of technocratic approaches does not lie in the use of algorithms itself, but in the pretension of reducing multidimensional phenomena to fully formalizable data structures. As Morin states, simplifying knowledge fragments reality, artificially separates its components, and loses sight of the interdependencies that constitute it [12, 13]. Applied to criminal analysis, this implies that no predictive system can fully capture the complexity of crime if it disregards territorial, historical, social, and institutional factors.

One of the central contributions of complex thinking is the notion of organizational recursivity, particularly useful for interpreting the functioning of predictive systems in public security. When an institution concentrates surveillance in certain territories due to algorithmic predictions, such intervention generates new data that later feed the system again, reinforcing the initial patterns. In this sense, artificial intelligence not only analyzes criminal reality, but also participates in its institutional reconfiguration. This finding coincides with studies warning about the relationship between historical data bias, over-policing, and the automated reproduction of inequalities [8, 11, 16].

Likewise, the discussion on explainability and meaningful human oversight acquires an epistemological rather than merely technical character. Algorithmic opacity is not only a problem of access to code or interface design, but a limitation in the institutional capacity to justify decisions affecting rights and intervention priorities. From a complex perspective, the legitimacy of AI-assisted criminal analysis depends on the possibility of integrating calculation, interpretation, institutional prudence, and ethical responsibility.

In this line, algorithmic governance appears as a point of convergence between technology, law, ethics, and institutional organization. The international frameworks reviewed insist on the need for transparency, accountability, and human control [17-21], but the review shows that these principles do not always effectively translate into concrete practices. Therefore, the decisive question is not only whether an institution has artificial intelligence, but under what criteria it incorporates it, who audits its results, what type of data it uses, and what mechanisms exist to correct errors, biases, or unforeseen effects.

In epistemological terms, the analysis carried out makes it possible to argue that complex thinking constitutes a necessary corrective to the risks of excessive objectification of crime. It is not a matter of rejecting artificial intelligence, but of preventing its use from turning criminality into a purely computational object. Criminal analysis requires hybrid models of knowledge in which the analytical capacity of technology is complemented by human interpretation, territorial knowledge, institutional reflection, and public responsibility.

6. Conclusions

Artificial intelligence represents a relevant transformation in contemporary processes of criminal analysis and public security. Its capabilities to process massive data, identify patterns, and support institutional decisions offer significant opportunities to strengthen crime prevention and operational management. However, such potentialities should not lead to an uncritical acceptance of their assumptions, scope, and effects.

The present study identified that the main epistemological challenges of artificial intelligence applied to criminal analysis are concentrated in five dimensions: the algorithmic reduction of the criminal phenomenon, the reproduction of structural biases contained in institutional data, the opacity of models, the fragility of human oversight, and the insufficiency of robust algorithmic governance frameworks.

From complex thinking, it is concluded that crime cannot be understood as a simple, stable, and fully predictable reality. It is a relational, multidimensional, and dynamic phenomenon whose interpretation requires articulating quantitative information, territorial knowledge, institutional experience, and ethical reflection. Consequently, artificial intelligence should not be conceived as a substitute for human judgment or as a neutral predictive device, but as a support tool that requires constant contextualization.

The main contribution of this article lies in proposing that complex thinking offers an adequate epistemological framework to critically problematize the use of artificial intelligence in criminal analysis. This approach makes it possible to overcome reductionist views of crime and move toward a more responsible understanding of algorithmic systems applied to public security.

In practical terms, the findings suggest the need to strengthen data quality, develop auditing and explainability mechanisms, consolidate models of meaningful human oversight, and promote institutional frameworks of algorithmic governance guided by principles of transparency, proportionality, fairness, and accountability.

As a limitation, the study did not evaluate specific algorithmic systems nor include empirical fieldwork, so future research should move toward comparative studies of concrete experiences in the use of artificial intelligence in police institutions and justice systems, particularly in Latin American contexts.

Abbreviations

AI	Artificial Intelligence
XAI	Explainable Artificial Intelligence
UNODC	United Nations Office on Drugs and Crime
UNESCO	United Nations Educational, Scientific and Cultural Organization
OECD	Organisation for Economic Co-operation and Development
Big Data	Large Volumes of Digitally Processed Data
Predictive Policing	Predictive Policing or Police Predictive Analysis

GIS	Geographic Information Systems
ML	Machine Learning
WoS	Web of Science

Author Contributions

Jose Del Carmen Encarnacion Dicent: Conceptualization, Formal Analysis, Investigation, Methodology, Writing – original draft, Writing – review & editing

Conflicts of Interest

The author declares no conflicts of interest.

References

[1] Brayne S. Predict and Surveil: Data, Discretion, and the Future of Policing. Oxford: Oxford University Press; 2020.

[2] Ferguson AG. The Rise of Big Data Policing: Surveillance, Race, and the Future of Law Enforcement. New York: NYU Press; 2017.

[3] Perry WL, McInnis B, Price CC, Smith SC, Hollywood JS. Predictive Policing: The Role of Crime Forecasting in Law Enforcement Operations. Santa Monica: RAND Corporation; 2013.

[4] Chainey S, Ratcliffe J. GIS and Crime Mapping. Chichester: Wiley; 2005.

[5] Crawford K. Atlas of AI: Power, Politics, and the Planetary Costs of Artificial Intelligence. New Haven: Yale University Press; 2021.

[6] Kitchin R. The Data Revolution: Big Data, Open Data, Data Infrastructures and Their Consequences. London: Sage; 2014.

[7] Capra F. La trama de la vida: una nueva perspectiva de los sistemas vivos. Barcelona: Anagrama; 1998.

[8] Lum K, Isaac W. To predict and serve? Significance. 2016; 13(5): 14-19. https://doi.org/10.1111/j.1740-9713.2016.00960.x

[9] Noble SU. Algorithms of Oppression: How Search Engines Reinforce Racism. New York: NYU Press; 2018.

[10] Richardson R, Schultz J, Crawford K. Dirty Data, Bad Predictions: How Civil Rights Violations Impact Police Data, Predictive Policing Systems, and Justice. NYU Law Review Online. 2019; 94: 192-233.

[11] Eubanks V. Automating Inequality: How High-Tech Tools Profile, Police, and Punish the Poor. New York: St. Martin's Press; 2018.

[12] Morin E. Introducción al pensamiento complejo. Barcelona: Gedisa; 2004.

[13] Morin E. El Método I: La naturaleza de la naturaleza. Madrid: Cátedra; 1997.

[14] Braun V, Clarke V. Using thematic analysis in psychology. Qual Res Psychol. 2006; 3(2): 77-101. https://doi.org/10.1191/1478088706qp063oa

[15] Creswell JW. Research Design: Qualitative, Quantitative, and Mixed Methods Approaches. 5th ed. Thousand Oaks: Sage; 2018.

[16] Završnik A. Criminal justice, artificial intelligence systems, and human rights. ERA Forum. 2021; 20(4): 567-583. https://doi.org/10.1007/s12027-019-00596-0

[17] Yeung K. Algorithmic regulation: A critical interrogation. Regul Gov. 2018; 12(4): 505-523. https://doi.org/10.1111/rego.12158

[18] Leslie D. Understanding Artificial Intelligence Ethics and Safety. London: The Alan Turing Institute; 2020.

[19] UNESCO. Recommendation on the Ethics of Artificial Intelligence. Paris: UNESCO; 2021.

[20] UNODC. Artificial Intelligence and Criminal Justice. Vienna: United Nations; 2021.

[21] Floridi L, Cowls J, Beltrametti M, et al. AI4People—An ethical framework for a good AI society. Minds Mach. 2018; 28(4): 689-707. https://doi.org/10.1007/s11023-018-9482-5