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ETHICAL PRINCIPLES OF ARTIFICIAL INTELLIGENCE IN SCIENTIFIC RESEARCH: A SYSTEMATIC REVIEW OF BIAS, PRIVACY, TRANSPARENCY, AND GOVERNANCE

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I. Abstract

The study addresses the ethical implications of artificial intelligence in scientific research and contributes to the achievement of Sustainable Development Goal 9: Industry, Innovation, and Infrastructure. Its objective was to systematically analyze the integration of ethical principles, algorithmic bias, data privacy, transparency, and governance, in the use of AI applied to scientific research, in order to build an integrative ethical framework to guide its responsible application. This qualitative, descriptive-analytical study systematically analyzed 15 studies selected from 65 scientific articles published between 2023 and 2025. The results show that the implementation of artificial intelligence optimizes processes and strengthens institutional trust, reveals significant risks in algorithmic biases that exacerbate inequalities affecting the validity of results; privacy is threatened by the misuse of sensitive data; transparency compromises scientific replicability and credibility; and the absence of governance creates regulatory gaps that limit the social legitimacy of productive knowledge. It is concluded that artificial intelligence is a strategic tool for digital transformation and organizational sustainability, provided it is managed under ethical principles, clear frameworks, and responsible practices that ensure equity, trust, and social acceptance.

Key words: Artificial intelligence, research ethics, transparency, data protection.

II. Introduction

Ethics in artificial intelligence (AI) raises crucial dilemmas regarding data protection, the transparent use of algorithms, the responsible management of information interpretation, and equitable access to knowledge. The United Nations Educational, Scientific and Cultural Organization (2024) noted at the 2024 Global Forum on the Ethics of AI, the rise of AI, emphasizing that it is creating new opportunities worldwide, facilitating medical diagnosis, connecting people through social media, and improving workplace efficiency through task automation—a development that contributes to the achievement of Sustainable Development Goal (SDG) 9 by fostering industrial development, innovation, and infrastructure. These changes raise profound ethical dilemmas due to the potential of AI systems to exacerbate inequalities, reproduce biases, and threaten human rights by translating fundamental principles and values into actions that undermine the care of ecosystems, the environment, education, gender equality, health, research, and social welfare.

In Latin America, the ethical challenges of AI in scientific research center on ensuring strict respect for human rights, which translates into dignity, sustainability, and inclusion. The United Nations Educational, Scientific and Cultural Organization (2025) emphasizes that AI has become a fundamental tool with great transformative power in the 21st century. At the conference "AI in Latin America and the Caribbean: Challenges, Strategies, and Governance for the Region's Development," held on March 4 and 5 at the headquarters of the Economic Commission for Latin America and the Caribbean (ECLAC) with the participation of government leaders, private sector representatives, experts in technology management, academics, and civil society, it was specified that the use of AI must take into account the 2021 recommendation on AI ethics, as well as the Readiness Assessment Methodology (RAM) approved by 193 States, an initiative that enabled 14 States to design or update their national AI strategies with the assistance of UNESCO. It was recommended that AI must be explainable and transparent, avoiding biases that exacerbate social and cultural inequalities, with a focus on protecting sensitive data and privacy in scientific projects, and ensuring equitable access to technologies related to the use of AI. Latin American countries were urged to establish regulations governing the creation of specialized ethics committees, so that the use of AI becomes a fundamental tool for strengthening scientific integrity and contributing to sustainable development.

In Peru, the ethical implications of AI in scientific research require the scientific community to use AI in accordance with the principles of transparency, integrity, and respect for intellectual property, providing clear explanations and justifications for their actions, and ensuring the protection of sensitive information and the privacy of participants. The Presidency of the Council of Ministers of Peru (2025), through the Secretariat of Government and Digital Transformation of the Presidency of the Council of Ministers (PCM), presented the report on the AI Readiness Assessment (RAM), highlighting that it is a useful tool for leading the debates on AI currently taking place in Peru; the report is contributing to the design of public policies centered on inclusive, ethical, and responsible AI management based on human rights. It was specified that the RAM methodology, in addition to providing an assessment, proposes a roadmap implemented through a variety of stakeholders, as highlighted in AI Law No. 31814 and its regulations, documents that govern its practical application. This situation requires institutional accountability for the information generated by algorithms and equitable access to AI applications, so that research centers and universities lacking the necessary resources are not left behind. The resolution urges Peru to regulate, promote, and develop public policies and establish ethics committees to ensure that AI becomes a tool that safeguards scientific integrity and contributes to the sustainable development of the State.

In light of the above, the following research question was formulated: How are the ethical principles of algorithmic bias, data privacy, transparency, and governance integrated into the use of artificial intelligence in scientific research? What conceptual frameworks emerge from the available evidence, and what regulatory proposals emerge from the available evidence?.

In theory, the rationale centers on the need to understand the ethical principles of AI in the practice of scientific research, drawing on solid conceptual frameworks in the philosophy of technology, epistemology, and bioethics. This leads to an analysis of how AI transforms the generation and production of knowledge, discussing intellectual autonomy and raising dilemmas regarding researchers' freedom in the face of digitized systems. The study is grounded in the

universal principles of justice, freedom, and transparency, ensuring that scientific development remains aligned with the practice of ethical and social values.

The methodology is justified by the need to adopt an interdisciplinary and comparative approach that integrates both literature reviews and case studies with contexts in which AI is applied in science. This involves designing analytical tools to help identify the benefits, risks, and best practices for knowledge generation, comparing various social, educational, technological, and legal perspectives, following processes that ensure the validity, rigor, and reliability of the research, and obtaining results that are applicable and transferable to different scientific and academic fields.

In practice, the rationale is that the research findings provide sound guidelines for the ethical management of AI-integrated scientific studies, including the protection of sensitive information, transparency in the development of findings, equity in the distribution of benefits, and caution regarding algorithmic biases, which can undermine the legitimacy and quality of the knowledge produced. In this sense, the study not only contributes to academic discourse but also serves as a useful tool for researchers, regulatory bodies, and institutions, ensuring that technological innovation translates into social benefits and responsible progress.

The research was conducted within the broader objective of systematically analyzing how the ethical principles of algorithmic bias, data privacy, transparency, and governance are integrated into the use of AI in scientific research, with the aim of developing a comprehensive ethical framework to guide its responsible application; from which the specific objectives are derived: to examine evidence of algorithmic bias in the application of AI in scientific research and its ethical implications for the validity and fairness of results. Analyze the risks and approaches to privacy protection in the handling of scientific data using AI, taking into account international standards and current regulations. Evaluate transparency practices in the design, implementation, and communication of results obtained with AI in scientific contexts, identifying barriers and best practices. Explore models of ethical governance applied to the regulation and oversight of AI in scientific research, highlighting regulatory proposals and institutional policies. Integrate the findings into a systematic ethical framework that articulates bias, privacy, transparency, and governance as foundational principles to guide the responsible use of artificial intelligence in the production of scientific knowledge.

The study is grounded in Zegarra's (2024) research, which sought to explore the ethical challenges of using AI in scientific publishing. It was conducted using a basic qualitative approach that analyzes categories based on the need for responsible use of information. It specifies challenges such as biases introduced by AI due to the inadequacy of the methodological process for detecting AI-generated data. It identifies the dual nature of scientific publications, noting that while it is true that AI applications can improve the clarity of communication, irresponsible use can introduce biases and affect the analytical depth of the research. The study concluded that the incorporation of AI into scientific publications presents both opportunities and challenges, which must be addressed with rigorous ethical and academic principles.

The study by Trevizan & Dias (2025), which aimed to analyze the impact of AI on scientific writing, is a qualitative systematic review based on a search for articles in English,

Portuguese, and Spanish in the PubMed database using the keywords "plagiarism," "AI," "scientific research," and "academic integrity" across seven scientific articles. The results highlight that the ethical impact of AI is concerning due to data fabrication, plagiarism, and compromised authorship. The authors agree that human oversight is necessary for the ethical use of AI, emphasizing that transparency must be a fundamental requirement in the use of AI and recommending that institutions and publishers use AI responsibly to avoid risks of bias, misinformation, and plagiarism. The study concluded that AI tools help improve scientific writing by providing technical support and efficiency; AI cannot replace critical reflection and ethical considerations in research; it advocates for human oversight in the use of AI to ensure responsible research practice and academic integrity.

Villasmil's (2023) study sought to reflect on the ethical implications of using AI in the production of high-impact scientific articles. It employed a hermeneutic documentary approach, which involved organizing and interpreting interdisciplinary debates related to AI and human intelligence within academic communities and society at large based on the sources collected. The results indicate that the integration of AI into knowledge production is unlikely to be reversed, as there are profound and varied implications for society at large and academic communities. The study concluded that

the phenomenon of AI currently constitutes the fundamental core of knowledge production, and that this trend is unlikely to be reversed. It highlights that the use of AI in the production of high-impact scientific articles has varied and profound implications, suggesting careful consideration of the ethical dimensions of its adoption.

The study by Guerrero et al. (2025) critically analyzed the role of AI in scientific production through a comprehensive systematic review of recent literature, aiming to provide an overview of the use of AI in reshaping research, while highlighting relevant measures to ensure its responsible use. It addresses three fundamental areas: academic integrity, research efficiency, and the development of research competencies in the digital age. The study concludes that the integration of AI into scientific research has made significant progress, driving advancements in machine learning across various sectors, big data, and natural language processing. It notes that the use of AI influences the different stages of the research process, from problem formulation and hypothesis development to the dissemination of results, and is defined by three critical dimensions: efficiency, by streamlining research processes and improving analytical accuracy; accessibility, by making applications available to the academic community with limited resources; and complexity, by addressing the study of multidimensional problems, which requires the establishment of standardized validation protocols, global ethical frameworks, hybrid (human-AI) models, and the reduction of technological inequality.

The Bhutiani (2025) study sought to critically examine the role of AI in the production of research publications, analyzes concerns regarding transparency and trust in AI-driven processes, and concludes that the growing use of algorithms highlights the value of AI in academic contexts, such as data analysis, problem-solving, and application writing. The study concluded that, while the use of AI improves efficiency in research processes, it also raises significant concerns regarding transparency and trust in scientific discoveries.

The study by Llerena & Ayala (2025) critically analyzed the challenges posed by the growing integration of AI in academia and research. This is a qualitative and systematic review based on the analysis of 60 articles, from which specific areas, categories, and tools of AI were identified, highlighting the challenges, uncertainties, and opportunities that arise in various fields of knowledge. The study concluded that the integration of AI into academia and research poses challenges and offers significant opportunities, requiring an ethical framework and clear guidelines to ensure that AI is used responsibly.

Limongi's (2024) scientific article addressed the ethical and integrity challenges posed by the integration of AI into scientific research; it is a qualitative study that emphasizes a holistic approach encompassing education, accountability, transparency, and active participation to ensure that AI is incorporated into scientific research in a responsible and ethical manner. It emphasizes the collaboration of stakeholders in creating auditable and transparent algorithms to integrate AI into scientific research. The study concluded that the integration of AI into scientific research requires maintaining integrity and ethics as fundamental pillars to ensure the validity, reliability, and social acceptance of knowledge. It advocates for ethical guidelines, regulatory frameworks, and international cooperation to ensure that advances in AI benefit humanity in a fair and responsible manner.

The article by Dávila & Agüero (2023), which assessed the ethical challenges of AI while considering its implications for society and the economy, is a qualitative literature review based on articles retrieved from Scopus and Google Scholar using the keywords "AI," "challenges," and "ethics." The results revealed that the most relevant ethical challenges are responsibility, accountability, decision-making, bias, privacy, equity, and data protection. It was concluded that the implications for society and the economy boil down to socioeconomic inequality, loss of human control, changes in the workforce, professional ethics, technological dependence, and legal and regulatory challenges.

The ethical principles of artificial intelligence in scientific research are defined as a set of interrelated challenges involving algorithmic bias, which affects the impartiality and validity of results; data privacy, linked to the responsible handling of sensitive information; transparency and accountability, necessary to ensure reproducibility and responsibility; institutional responsibility, understood as a scientific organization's commitment to ensuring ethical, transparent, and reliable practices in the use of AI in research; and governance and social trust, as pillars for legitimizing the integration of AI into science. These subcategories determine the social acceptance and validity of knowledge production through the use of AI (Gimeno & Trigo, 2024).

The ethical principles of artificial intelligence in scientific research are multidimensional and include the following subcategories: algorithmic bias, understood as the amplification or reproduction of prejudices present in the conduct and design of research, affects the fairness and validity of results, leading to potentially discriminatory conclusions.

Data privacy, which involves the protection of participants' sensitive and personal information, carries risks such as data leaks, misuse, or commercialization, affecting security and trust. Transparency, which requires that the algorithms, processes, and decisions made by AI be auditable and understandable, jeopardizes the replicability, validity, and trust in scientific results if neglected. Ethics demands anonymization, regulatory compliance, and informed consent to guarantee fundamental human rights. Ethical management requires clear documentation, explainability, and transparency in the handling of models and data. Accountability, which clearly requires assigning responsibility for information generated with the help of AI; its omission can lead to chaos regarding authorship, consequences, or social errors in findings. Ethics demands clear protocols for attribution and accountability that ensure the trust and legitimacy of science. Social trust, which manifests itself in the credibility and acceptance that society grants to results produced with the help of AI; its absence would lead to mistrust, questioning, or rejection of the legitimacy of scientific knowledge. Ethics demands transparency, responsible practices, and clear communication that strengthen the interaction between technology, science, and society. Governance, which involves the establishment of policies, regulatory frameworks, and oversight mechanisms to regulate its use, would result in uncontrolled practices if absent, as it would affect the safety and legitimacy of the knowledge produced. From an ethical standpoint, it requires clear regulations, specialized committees, and institutional coordination to ensure responsible and sustainable scientific development (Resnik, 2025).

Resnik (2025) further categorizes these into: algorithmic biases, which affect the fairness and credibility of results, thereby requiring verification and auditing protocols; data privacy, since AI in scientific research relies on large volumes of data, much of which is sensitive; transparency, which addresses the applicability of models, key to scientific reproducibility; accountability, which seeks to clarify the diffuse attribution in AI projects; social trust, where public acceptance of AI-assisted research depends on perceptions of legitimacy and fairness; and governance, which manifests in the absence of robust regulatory frameworks, leading to regulatory gaps. Together, these subcategories help ensure the legitimacy, validity, and social acceptance of scientific knowledge produced by AI.

For their part, Llerena & Ayala (2025) consider algorithmic biases that can reproduce or amplify social and scientific inequalities as a subcategory; data privacy, which is highlighted by the need to protect participants' identities and ensure informed consent; transparency, the lack of which limits trust in the results and hinders ethical evaluation; accountability, which seeks to clearly define who is responsible for errors, biases, or misuse of results; social trust, which is built through education, transparency, and the active participation of scientific and social communities; and governance, which proposes moving toward international and collaborative policies that ensure the responsible use of AI in scientific research.

The research is grounded in deontological theory, inspired by Kant's ideas, which holds that actions must be guided by universal principles and moral duties, regardless of the consequences. Its application to the ethics of AI in scientific research requires that the use of AI respect data privacy, transparency, and institutional accountability, even if the results might be beneficial (Resnik, 2025). The study aims to ensure that the use of AI leads to ethical practice, without abandoning the traditional normative principles of science.

The utilitarian theory, as explained by Llerena & Ayala (2025), proposes that actions should be evaluated based on their ability to maximize collective well-being. In scientific research, this applies to the balance between the benefits of AI—namely, discovery and efficiency—and the risks associated with bias and the loss of social trust. It specifies that the integration of AI into scientific research must be evaluated by taking into account both opportunities and risks, with the aim of seeking the greatest possible social benefit.

The theory of virtue ethics, which, according to Madanchian & Taherdoost (2025), draws inspiration from Aristotle's ideals and emphasizes the development of virtues such as justice, prudence, and responsibility among decision-makers. Its utility in AI ethics as applied to scientific research promotes the building of social trust and ethical governance, and is responsible for fostering responsible practice beyond mere norms or utility calculations. It argues that the responsible

adoption of AI requires governance models based on ethical values and organizational virtues that ensure legitimacy and sustainability.

The theories presented play a fundamental role in research, offering conceptual frameworks that enable the definition of categories and subcategories of study, the interpretation of complex phenomena, and the establishment of consistent criteria for analysis. In the case of ethical principles for AI in scientific research, the three theories offer different perspectives for understanding how bias, privacy, transparency, and governance should be managed in the handling of information. By utilizing these three theories, researchers can inform methodological and ethical decisions that ensure the validity and legitimacy of information or results, developing proposals that address immediate challenges and contribute to the sustainable and responsible development of scientific knowledge.

III. METHODOLOGY

Following the guidelines of the Organization for Economic Cooperation and Development (OECD, 2018), this study falls under the basic research category, focusing on the field of organizational and process innovation, as it sought to understand how the integration of AI into scientific research transforms regulatory frameworks, institutional practices, and methods of knowledge production; through systematic analysis, it interprets and synthesizes the evidence to generate ethical guidelines that reinforce the legitimacy and social acceptance of scientific research. The study is qualitative, descriptive, and analytical in nature, employing a systematic documentary design; it aims to compile, analyze, and systematize the available scientific evidence regarding the ethical principles of AI in scientific research. It involved a critical review of available scientific, regulatory, and theoretical articles, identifying categories, subcategories, patterns, and conceptual relationships related to algorithmic biases, data privacy, transparency, and governance.

From the category of ethical principles of AI in scientific research, four subcategories emerge: algorithmic bias, with its indicators: problem identification, consequences of bias, mitigation strategies, ethical and regulatory framework, collaboration and governance, and training and education. Data privacy, with its indicators: ethical protocols, regulatory standards, security, privacy, and data protection practices, transparency and informed consent, and institutional accountability and public trust. Transparency, with its indicators: explanation of algorithms and decisions, documentation and traceability, reliability and reproducibility, explainability and technical tools, dissemination and communication, accountability and ethics, and regulation and oversight. Governance, with its indicators: regulatory approach, governance models, ethical principles, oversight and control, interdisciplinary participation, adaptability and updating, external references, practical application, and institutional innovation (Gimeno & Trigo, 2024).

Initially, 65 scientific articles on the ethical challenges of artificial intelligence in scientific research were identified; these were published in journals indexed in specialized databases between 2023 and 2025. For the systematic review, articles were selected whose content aligned with the categories and subcategories established for the study, resulting in a total of 15 articles, as shown in the table below:

Table 1

Articles on the ethical principles of artificial intelligence in scientific research

Título del Artículo	DOI
Balancing innovation and integrity: the role of AI in research and scientific writing (BaHammam, 2023)	https://doi.org/10.2147/NSS.S455765
Specific challenges posed by artificial intelligence in research ethics (Bouhouita y otros, 2023)	https://doi.org/10.3389/frai.2023.1149082
A model of the interrelationship between research ethics and research integrity (Muthanna y otros, 2023).	https://doi.org/10.1080/17482631.2023.2295151
Research integrity in the era of artificial intelligence: Challenges and responses (Chen y otros, 2024)	https://doi.org/10.1097/md.0000000000038811
The role of artificial intelligence technologies in evaluating the veracity of scientific research (Kharipova y otros, 2024)	https://doi.org/10.58346/JISIS.2024.I4.035
Influence o f artificial intelligence and chatbots on research integrity and publication ethics (Hosseinzadeh y otros, 2024).	https://doi.org/10.6087/kcse.323

The role of artificial intelligence in scientific publishing: perspectives from the hospital pharmacy (Gimeno & Trigo, 2024)	https://doi.org/10.1016/j.farma.2024.06.002
The use of artificial intelligence in scientific research with integrity and ethics (Limongi, 2024).	https://doi.org/10.24023/ FutureJournal/2175-5825/2024. v16i1.845
The ethics of using artificial intelligence in scientific research: new guidance needed for a new tool (Resnik, 2025).	https://doi.org/10.1007/s43681-024-00493-8
Research ethics and issues regarding the use of ChatGPT-like artificial intelligence platforms by authors and reviewers: a narrative review (Kim, 2024).	https://doi.org/10.6087/kcse.343
Ethical considerations regarding the use of artificial intelligence tools in research and publication (Saif y otros, 2024)	10.53555/ks.v12i4.3133
Ethical considerations in the use of AI for academic research and scientific discovery: a narrative review (Shah y otros, 2025).	https://doi.org/10.71000/jfesgv69
Ethics in artificial intelligence: ensuring integrity in research and media (Cesário & Campos, 2025).	doi.org/10.1007/978-3-031-97257-7_11
Ethical limits and suggestions for improving the use of AI in scientific research, academic publishing, and the peer review process, based on deontological and consequent viewpoints (Daoudi, 2025).	https://doi.org/10.1007/s44217-025-00696-z
Artificial intelligence in scientific research: challenges, opportunities and the imperative of a human-centric synergy (Branda y otros, 2025).	https://doi.org/10.1016/j.joi.2025.101727

Note. Information obtained fron a database of indexed journals.

The observation technique was used in conjunction with documentary and critical analysis, which allowed the information to be organized into a triangulation matrix that facilitated qualitative interpretation. A data sheet was used as a tool to record, organize, and systematize the information extracted from the fifteen scientific articles according to the following subcategories: algorithmic bias, privacy, transparency, and governance. The instrument facilitated critical observation and understanding across sources, ensuring methodological consistency and rigor in the qualitative analysis. According to Hernández & Menoza (2018), the data sheet is a key tool for structuring the review of information, ensuring the interpretive validity of the study. It consisted of five items, one for each subcategory. The instrument was validated by five experts who, after evaluating its internal and external consistency, issued a favorable opinion for its application to the sample. Reliability was ensured based on criteria of transferability and credibility regarding timing, theoretical alignment, and information analysis, as well as on the comparison of the responses recorded in the triangulation matrix (Borjas, 2021).

The analysis and interpretation of the results were conducted for each objective, derived from the categories and subcategories using the triangulation method, which allowed us to identify similarities and differences in the responses to each item across the 15 articles and present them in tables along with their respective analysis and interpretation. These data were used to discuss the results in light of the background and theoretical frameworks underpinning the research (Arias et al., 2022). The ethical principles of scientific integrity were upheld, respecting copyright and writing standards.

III. Resultados

A systematic analysis of the integration of ethical principles regarding algorithmic bias, data privacy, transparency, and governance in the use of AI applied to scientific research— with the aim of developing an integrative ethical framework to guide its responsible application—enabled a comparison of the responses based on the information collected in the data sheet. The comparison of responses involved conducting the analysis and corresponding interpretation, in accordance with the specific objectives linked to the subcategories, which seek to examine how algorithmic bias, data privacy, transparency, and governance manifest and are managed in the integration of artificial intelligence into scientific research.

Table 2

Evidence of algorithmic bias in the application of ai in scientific research and its ethical implications for the validity and fairness of results

Indicators	Similarities and differences in the responses
Identification of the problem	It is recognized that the presence of algorithmic biases in AI and their negative impact on scientific research affect reproducibility, objectivity, validity, and credibility. Some articles emphasize biases in training data (unrepresentative information, ChatGPT), others in algorithmic processes (parameters and models), and still others in specific platforms (chatbots).
Consequences of Bias	Biases lead to discrimination, unreliable results, biased conclusions, and a loss of scientific credibility. Errors and plagiarism are highlighted, as are the impact on creativity and objectivity, and the perpetuation of social inequalities.
Mitigation strategies	The studies propose auditing, transparency, human oversight, and data diversity as key mechanisms. Some suggest ongoing validation and rigorous data curation; others emphasize training and ethical education; still others focus on testing the robustness and interpretability of models.
Ethical and Regulatory Framework	They highlight the need for regulations, ethical frameworks, and standardized guidelines to guide the responsible use of AI. Some articles emphasize institutional accountability and research autonomy; others underscore the involvement of social stakeholders and interdisciplinary collaboration.
Collaboration and Governance	It is widely recognized that collaboration among institutions and researchers is essential for enhancing credibility and reducing bias. There are differences in approach: some emphasize stakeholder participation; others focus on academic governance and public policy.
Training and Education	There is broad agreement on the importance of training in ethics and AI management. There is a clear proposal to make ethics training a central strategy; others suggest it as a complement to transparency and auditing.

Note. Information obtained fron a triangulation matrix table according to the ítems of the instrument used in the systematic review.

The literature presented in the table reflects a consensus regarding the identification of the problem: algorithmic biases pose a direct threat to the validity, objectivity, and credibility of scientific research. Although there is agreement on recognizing their negative impact, studies differ in the level of analysis; some emphasize biases stemming from unrepresentative training data, others focus on algorithmic parameters and models, and a third group on specific platforms, such as chatbots. This diversity reflects the complexity of the phenomenon and the need to address it from multiple technical and social dimensions.

Regarding the consequences of biases, the generation of unreliable results, the reproduction of social inequalities, and the loss of scientific credibility are highlighted. The articles agree that biases affect not only methodological quality but also the legitimacy of the knowledge produced. Furthermore, they point to side effects such as plagiarism, diminished creativity, and compromised objectivity, which broadens the discussion to the cultural and social impact of AI in science.

Regarding mitigation strategies, there is consensus on the importance of auditing, transparency, and human oversight, as well as the need for data diversity. However, some studies place greater emphasis on constant validation and rigorous data curation, while others highlight ethical training and model explainability. This plurality of approaches demonstrates that there is no single solution, but rather a set of complementary practices that must be integrated into a rigorous ethical framework.

Within the ethical and regulatory framework, rigorous data curation and ethical training emerge as indispensable conditions for guiding the responsible use of AI. The articles agree on the need for standardized regulations and standards, though they differ in emphasis: some highlight institutional accountability and research autonomy, while others emphasize social participation and interdisciplinary collaboration. This reveals a tension between more normative approaches and more participatory ones; both are necessary to ensure legitimacy and effectiveness.

In the realm of collaboration and governance, it is recognized that cooperation among institutions and researchers is key to reducing biases and strengthening credibility. However, approaches vary: some prioritize the participation of social actors and stakeholders, while others focus on academic governance and public policy. This difference reflects the need to establish multilevel governance mechanisms that integrate academia, society, and the state.

Training and education are presented as a cross-cutting theme. There is consensus that training in ethics and AI management is essential; however, while some studies consider it a central strategy, others complement it with transparency and auditing practices. This suggests that ethical training should not be an afterthought, but rather a structural component in the preparation of researchers and developers.

The analysis shows that the discussion on bias, privacy, transparency, and governance in AI applied to scientific research transcends technical considerations and becomes a scientific and social contribution. The systematic review not only contributes to consolidating an integrative ethical framework but also offers tools to strengthen the credibility of science, guarantees the protection of fundamental rights, and promotes inclusive governance. For this reason, the work's contribution to society lies in guiding the development of fair, transparent, and responsible AI capable of generating reliable and socially legitimate knowledge.

Table 3

Risks and approaches to privacy protection in the handling of scientific data using ai, taking into account international standards and current regulations

Indicators	Similarities and differences in the responses
Ethical protocols	Studies acknowledge the need for clear protocols from the outset of projects. Protocols must include informed consent, anonymity, and traceability, and AI research requires specific protocols. Some studies highlight protocols linked to international regulatory frameworks (GDPR, AI Act), while others emphasize internal institutional protocols and scientific integrity guidelines.
Regulatory standards	The articles agree that it is important to adopt clear legal frameworks and ethical standards to regulate the use of data, and they highlight the need for guidelines on scientific integrity and codes of conduct. They highlight differences in scope, as some emphasize global regulations (GDPR, AI Act), while others focus on institutional or local standards, and warn that, in practice, international regulations are applied unevenly.
Safety practices	Studies recommend measures such as restricted access, encryption, and security audits; they acknowledge the need to adopt responsible practices to prevent plagiarism, manipulation, or improper disclosure. According to some studies, the differences lie in rigorous human oversight and cybersecurity practices; others emphasize transparency in external AI services and peer review.
Privacy and Data Protection	The articles agree that security and privacy are the cornerstones of ethics in scientific research, and they emphasize the ethical obligation to protect personal and sensitive data. There are differences in approach: some studies highlight protection against unauthorized access, while others focus on the risks of plagiarism and misinformation.
Transparency and informed consent	Studies acknowledge that informed consent and transparency strengthen public trust, highlighting the need for institutional accountability and ethical governance. The difference lies in the fact that some studies emphasize transparency in the use of external artificial intelligence tools, while others stress the need for consistent ethical oversight in scientific publications and codes of conduct.
Institutional accountability and public trust	The articles agree that the rigorous application of ethical measures strengthens scientific trust and integrity, recognizing the importance of independent evaluation and traceability. They highlight differences in the level of responsibility, as some emphasize the obligations of authors and publishers, while others focus on international regulatory frameworks and institutional accountability.

Note. Information obtained fron a triangulation matrix table according to the ítems of the instrument used in the systematic review.

The data in Table 3 show a clear consensus regarding the need for specific ethical protocols for AI projects in scientific research. The studies highlight that such protocols must include informed consent, anonymity, and traceability, but differ in their point of reference: some emphasize international regulatory frameworks such as the GDPR or the AI Act, while others prioritize internal institutional guidelines and scientific integrity guidelines. This difference reflects the tension between global standardization and local adaptation of ethical practices.

There is consensus regarding regulatory standards, which underscore the importance of having clear legal frameworks and codes of conduct. However, differences in scope have been identified: while some studies highlight the relevance of

international regulations, others note that their application is uneven and that, in practice, institutional or local regulations predominate. This highlights the need to harmonize global standards with contextual realities.

Security practices are recognized as essential for ensuring scientific integrity. Measures such as restricted access, encryption, and audits are mentioned, but differences lie in the emphasis: some studies highlight human oversight and cybersecurity, while others focus on the transparency of external AI services and peer review. This suggests that security must be addressed from both a technical and a collaborative ethical perspective.

Regarding privacy and data protection, the articles agree that these constitute fundamental pillars of scientific ethics. However, approaches vary: some prioritize protection against unauthorized access, while others focus on risks such as plagiarism and misinformation. This diversity shows that privacy is not merely a technical issue, but also an epistemological and cultural challenge.

Transparency and informed consent emerge as key mechanisms for strengthening public trust. The studies agree on their relevance but differ in emphasis: some highlight transparency in the use of external AI tools, while others underscore the need for uniform ethical oversight in scientific publications and codes of conduct. This reveals that transparency must be cross-cutting, encompassing both technological design and scientific communication.

Institutional accountability and public trust are recognized as central elements for ensuring the legitimacy of research. There is consensus that the rigorous application of ethical measures strengthens scientific integrity, although differences are observed regarding the level of accountability: some studies emphasize the obligations of authors and publishers, while others highlight institutional accountability and international regulations. This suggests that public trust depends on multi-level ethical governance.

The analysis shows that the ethical principles of "bias, privacy, transparency, and governance" cannot be addressed in isolation, but rather as interdependent dimensions that form a comprehensive ethical framework for artificial intelligence in scientific research. The systematic review contributes to society by consolidating a theoretical and practical corpus that: reinforces the credibility and legitimacy of science, promotes the protection of fundamental rights in data management, advances ethical and institutional governance in the application of AI, and contributes to public trust in the production of scientific knowledge. In summary, this work offers a significant scientific contribution by proposing an integrative ethical framework that articulates protocols, standards, and practices regarding security, privacy, transparency, and institutional accountability, guiding the responsible use of artificial intelligence in scientific research.

Table 4

Transparency practices in the design, implementation, and communication of results obtained using ai in scientific contexts, identifying barriers and best practices

Indicators	Similarities and differences in the responses
Explanation of the algorithms and decisions	All the responses agree that algorithms must be clearly explained, including their decision-making criteria and limitations. Some studies emphasize the need for systems that are interpretable and auditable, while others focus on ensuring that the information is accessible to both experts and laypeople.
Documentation and traceability	The importance of process traceability, open documentation, and data provenance for validating results is emphasized. Some responses highlight the difference between the traceability of synthetic data and its labeling, while others mention the need for uniform attribution standards or editorial protocols.
Reliability and reproducibility	All the articles note that transparency enhances reproducibility, public trust, and scientific credibility. Some studies emphasize that accountability, peer review, and quality control are essential to ensuring transparency in scientific research.

Explainability and technical tools	Explainability is a fundamental aspect of understanding how AI generates results and processes data. It is worth noting that the difference lies in the level of detail: while some advocate for the routine use of explainability tools, others caution that their application remains limited.
Outreach and Communication	All studies emphasize the need to disclose the use of AI in research, describing its scope and limitations in accessible language. They do not agree on transparency in communication and informed consent, while others disagree on the details of the processes and the obligation to identify synthetic data.
Responsibility and Ethics	They agree that authors must ensure traceability, take full responsibility, and be accountable. They disagree, however, on the approach: some emphasize attribution standards and editorial protocols, while others insist on the need to distinguish between AI and human contributions.
Regulation and supervision	They agree that the scientific community must establish clear regulatory frameworks and guidelines. Some disagree with the proposal regarding models, authorship, and independent reviews, while others emphasize the need for ethical statements and international standards.

Note. Information obtained fron a triangulation matrix table according to the ítems of the instrument used in the systematic review.

The reviewed information shows a general consensus that explaining algorithms and decisions is essential to ensuring transparency. All studies agree that decision criteria and limitations must be clearly explained, although they differ in their emphasis: some highlight the need for interpretable and auditable systems, while others stress that the information must be accessible to both experts and non-specialist audiences. This difference reveals the tension between technical depth and the democratization of scientific knowledge.

Regarding documentation and traceability, the importance of data provenance and open documentation for validating results is recognized. However, responses differ on specific aspects: some studies point to the traceability of synthetic data and its labeling, while others emphasize the need for uniform attribution standards or editorial protocols. This demonstrates that traceability is not only technical but also regulatory and editorial.

Reliability and reproducibility are presented as pillars of transparency. There is consensus that transparency strengthens scientific credibility and public trust, but some studies add that accountability, peer review, and quality control are essential practices for ensuring reproducible results.

Regarding explainability and technical tools, all articles agree that it is essential to understand how AI generates results. The difference lies in the level of detail: some propose the routine use of explainability tools, while others caution that their application is still limited. This reflects a practical challenge—namely, the gap between the availability of tools and their actual implementation in scientific research.

In the field of dissemination and communication, there is recognition of the need to disclose the use of AI in studies, describing its scope and limitations in accessible language. However, discrepancies persist regarding transparency in informed consent and the obligation to identify synthetic data. This shows that ethical communication still faces barriers in terms of uniformity of criteria.

Responsibility and ethics are seen as central elements: authors must ensure traceability and accountability. However, differences arise in the approach: some insist on attribution standards and editorial protocols, while others emphasize the need to distinguish between human contributions and those generated by AI. This discussion is key to preserving scientific integrity and avoiding confusion regarding authorship.

Regarding regulation and oversight, there is consensus that the scientific community must establish clear regulatory frameworks. Differences are observed in scope: some studies propose authorship models and independent reviews, while others emphasize ethical statements and international standards. This reflects the need for multilevel ethical governance that combines global standards with local practices.

The analysis shows that transparency in scientific research involving AI is not limited to the technical explanation of algorithms, but encompasses documentation, traceability, reproducibility, accessible communication, ethical responsibility, and institutional regulation. The systematic review contributes to the field by identifying both best practices (explainability, traceability, peer review, accountability) and persistent barriers (limited application of technical tools, regulatory inequality, lack of consensus on communication and authorship). This scientific contribution is significant because it helps consolidate an ethical framework for transparency that strengthens the credibility of research, promotes public trust, and guides responsible AI governance in scientific contexts.

Table 5

Models of ethical governance applied to the regulation and oversight of ai in scientific research, highlighting regulatory proposals and institutional policies **Indicators Similarities and differences in the responses**

Policy Approach	There is a consensus on the need for clear policies and specific requirements to regulate the responsible use of AI in scientific research. However, there is disagreement regarding the importance that should be placed on international standards (UNESCO, AI Act), while others propose internal codes of conduct or specific editorial protocols.
Governance models	They recognize the importance of governance models that ensure accountability, transparency, and ethics. Some differ in terms of global and institutional cooperation; others include independent audits, ethics committees, interdisciplinary oversight, or editorial protocols.
Ethical Principles	They agree that responsibility, accountability, and data protection are common principles in nearly all responses. However, they differ regarding sustainability, scientific integrity, public trust, bias reduction, and equity as complementary principles.
Supervision and control	They agree on the need to use oversight tools to ensure compliance with ethical and legal standards. Their differences lie in the fact that some articles propose periodic audits and institutional reviews, while others advocate for human oversight protocols, consent, and a ban on AI being listed as an author.
Interdisciplinary participation	The involvement of ethics committees and specialists is valued, as is cooperation between institutions and the government. There is a contrast in that some studies propose broad and general participation, while others specify the inclusion of stakeholders, ethics training, and shared responsibility.
Adaptability and Updates	All studies agree that standards should be academic in nature and adapt to rapid technological advances. They differ in that some studies emphasize flexible regulatory frameworks, while others propose mechanisms for correcting biases, conducting ongoing evaluations, or addressing failures.
External references	Several responses highlight the need for existing international codes and guidelines. Their references vary: some cite UNESCO and the AI Bill of Rights, while others mention the European AI Act, standards on editorial protocols, and intellectual property regulations.
Practical application	They agree on the need to ensure that AI is used in a safe, ethical, and reliable manner in scientific research. They disagree, however, in that some emphasize scientific integrity and sustainability, while others prioritize privacy, security, risk mitigation, and public trust.
Institutional Innovation	They agree on the urgent need for the scientific community to develop its own frameworks and protocols. However, they differ in their approach: some propose the creation of specialized ethics committees, while others recommend providing access to tools, offering ethics training, and establishing uniform editorial protocols.

Note. Information obtained fron a triangulation matrix table according to the ítems of the instrument used in the systematic review.

The evidence suggests that, from a regulatory perspective, studies agree on the need for clear policies and specific requirements to govern the responsible use of AI in scientific research. However, a difference is observed in the reference level: some highlight the importance of international standards such as UNESCO or the AI Act, while others propose

internal codes of conduct or specific editorial protocols. This reflects the tension between global standardization and institutional autonomy. Regarding governance models, there is consensus that they must ensure accountability, transparency, and ethics. Differences center on the mechanisms: some studies emphasize global and institutional cooperation, while others include independent audits, ethics committees, interdisciplinary oversight, or editorial protocols. This demonstrates that ethical governance requires a combination of international structures and local practices. Regarding ethical principles, it is recognized that responsibility, accountability, and data protection are common to nearly all responses. However, some studies expand the framework to include sustainability, scientific integrity, public trust, bias reduction, and equity as complementary principles. This diversity shows that AI ethics in scientific research is dynamic and multidimensional.

Oversight and control are considered essential to ensuring compliance with ethical and legal standards. There is agreement on the need for oversight tools, although approaches differ: some propose periodic audits and institutional reviews, while others advocate for human oversight protocols, informed consent, and a ban on AI being listed as an author. This reflects a concern for preserving academic integrity and human authorship.

Interdisciplinary participation is valued as a key element. The importance of ethics committees, specialists, and cooperation between institutions and government is recognized. However, some studies propose broad and general participation, while others specify the inclusion of stakeholders, ethics training, and shared responsibility. This suggests that ethical governance must be inclusive and participatory.

In the area of adaptability and updating, all studies agree that standards must be academic and keep pace with rapid technological advances. Differences lie in the emphasis: some highlight flexible regulatory frameworks, while others propose mechanisms to correct biases, conduct ongoing evaluations, or address failures. This highlights the need for dynamic and resilient governance.

External references show that several studies draw on existing international codes and guidelines. However, the sources vary: some cite UNESCO and the AI Bill of Rights, while other studies mention the European AI Act, editorial standards, and intellectual property regulations. This reflects the diversity of regulatory frameworks that influence ethical governance.

Regarding practical application, there is consensus on guiding the use of AI toward safe, ethical, and reliable application in scientific production. Differences are observed in priorities: some emphasize scientific integrity and sustainability, while others highlight privacy, security, risk reduction, and public trust. This shows that ethical practice depends on the values prioritized by each scientific community.

Institutional innovation is recognized as urgent. There is agreement that the scientific community must develop its own frameworks and protocols, although approaches differ: some propose specialized ethics committees, while others recommend access to tools, ethics training, and uniform editorial protocols. This demonstrates that institutional innovation is key to strengthening ethical governance.

Table 6

Findings within a systematic ethical framework that integrates bias, privacy, transparency, and governance as foundational principles to guide the responsible use of artificial intelligence in the production of scientific knowledge

Ethics Principles	Similarities in the responses	Differences in responses
Algorithmic biases	They agree that algorithmic biases affect scientific validity and credibility.	Some studies highlight biases in training data, while others focus on algorithmic processes or specific platforms.

Privacy and data protection	All emphasize that the protection of personal and sensitive data is an ethical obligation.	They point out differences in approach: some prioritize unauthorized access, while others focus on the risks of plagiarism and misinformation.
Transparency in processes and results	They agree that transparency enhances reproducibility, public trust, and scientific credibility.	Some emphasize explainability and traceability, while others focus on accessible communication and editorial protocols.
Ethical and institutional governance	The need for clear regulatory frameworks and institutional policies is recognized.	There are differences in scope: some prioritize international standards (UNESCO, AI Act), while others focus on internal or local protocols.

Note. Information obtained fron a triangulation matrix table according to the ítems of the instrument used in the systematic review.

The table shows that the four ethical principles are interdependent subcategories and must be integrated into a coherent ethical framework. It is recognized that algorithmic biases affect the validity, reproducibility, and credibility of scientific research. Although studies differ on the source of biases (training data, algorithmic processes, or platforms), they all agree that mitigating them requires audits, data diversity, and human oversight. An ethical framework is required that recognizes the multiplicity of sources of bias and proposes comprehensive mitigation strategies

In the area of privacy, the protection of personal and sensitive data is viewed as an ethical pillar. Differences in approaches (unauthorized access vs. plagiarism and misinformation) show that privacy must be addressed as a cross-cutting principle, from both the perspectives of technical security and academic integrity.

Transparency must encompass both the technical dimension (algorithms, data) and the communicative dimension (clear and accessible dissemination). There is a consensus that transparency enhances reproducibility and public trust. However, some studies emphasize technical explainability and traceability, while others highlight accessible communication and editorial protocols. This reveals that transparency must be both technical and communicative.

Ethical governance must be multilevel, linking global standards with institutional practices adapted to the context. The need for clear regulatory frameworks and institutional policies is recognized. Differences lie in scope: some prioritize UNESCO's international standards and the AI Act, while others emphasize internal or local protocols. This demonstrates that ethical governance must be multilevel, linking global standards with institutional practices adapted to the context.

Integrating these findings makes it possible to construct a systematic ethical framework that not only identifies tensions and differences but also proposes an integrative vision: biases must be mitigated through transparency and oversight; privacy must be guaranteed through institutional governance; and transparency must be reinforced with ethical and regulatory protocols that ensure accountability.

The scientific contribution of this work lies in offering researchers, academic institutions, public policymakers, and AI developers a theoretical and practical framework that strengthens the credibility and legitimacy of scientific research and promotes public trust by ensuring transparency and data protection; in guiding the formulation of institutional and international policies for the ethical regulation of AI; and in reducing risks and inequalities through inclusive and adaptive governance strategies. It is characterized by the consolidation of an integrative ethical framework that articulates bias, privacy, transparency, and governance as constitutive principles of the responsible use of AI in the production of scientific knowledge.

V. Discussion

The first specific objective, which focuses on the presence of algorithmic biases and strategies to reduce their impact on scientific research, reveals a consensus among the analyzed articles: biases in AI negatively affect the quality and credibility of results. The most prominent mitigation strategies are auditing, transparency, and human oversight, which are considered essential pillars. These are complemented by ethical and regulatory frameworks, rigorous data curation, and

ethical training for researchers. Similarly, collaboration, governance, and academic training are recognized as necessary conditions for ensuring the responsible use of AI, though with variations in emphasis between participatory and institutional approaches. Zegarra (2024) contributes by pointing out the dual nature of AI in scientific publications: it can improve communicative clarity, but it can also introduce biases that limit analytical depth. (Resnik, 2025) argues that algorithmic biases affect the impartiality and credibility of results, requiring verification and audit protocols. Overall, the findings agree that it is essential to apply rigorous ethical and academic principles, ensuring accountability and legitimacy in the use of AI in scientific research.

The second objective, which focuses on the protocols, standards, and ethical practices that ensure data privacy and security in scientific research, highlights the need to apply these regulations from the very beginning of AI use. Regulatory frameworks must include clear guidelines and ethical codes governing data management, while security practices should aim to curb unethical conduct, preventing errors, manipulation, and plagiarism. The protection of privacy and information security are considered fundamental pillars of research ethics. Transparency and informed consent strengthen public and institutional trust and reinforce ethical governance. Institutional accountability requires rigorous implementation of ethical measures that ensure integrity and legitimacy. Trevizan & Dias (2025) note that AI tools improve scientific writing and provide technical efficiency, but they do not replace critical reflection or ethical considerations, which require constant human oversight. Similarly, Llerena

& Ayala (2025) underscore the importance of protecting participants' identities and ensuring informed consent, noting that a lack of transparency undermines trust in the results and hinders ethical evaluation. Overall, the emphasis is on the fact that ethics and human oversight are essential for the responsible use of AI in research.

Regarding the third specific objective, which concerns the details of transparency mechanisms in the use of AI for the production of scientific knowledge, it is worth highlighting the issue of the explainability of algorithms and decisions, which requires that algorithms be clearly explained. With regard to documentation and traceability, open processes and documentation are important for validating results. Trust and reproducibility reinforce scientific assurance and credibility. Explainability and technical tools are essential for understanding how AI generates data and results; dissemination and communication are fundamental for verifying the quality of the knowledge produced; responsibility and ethics ensure traceability, full accountability, and transparency; and regulation and oversight are crucial for the scientific community, as they serve to design and propose international, national, and institutional regulatory frameworks. These findings are similar to those reported by Villasmil (2023), highlighting that the phenomenon of AI currently constitutes the fundamental core of knowledge production, and it is unlikely that this trend will reverse. It is emphasized that the use of AI in the production of high-impact scientific articles has varied and profound implications, suggesting careful consideration of the adoption of ethical dimensions. It also reinforces the contributions of Resnik (2025) by asserting that the application of deontological theory in the ethics of AI in scientific research requires that the use of AI respect data privacy, transparency, and institutional accountability, even if the results might be beneficial.

The information gathered under the fourth specific objective regarding decision-makers and the outcomes resulting from the use of AI in scientific research reveals that it is human researchers and authors who make decisions and communicate the results; the role of AI is not that of a moral agent, as it is not legally liable nor is it an author; supervision and validation require critical review by experts, peer review, traceability, and human oversight. In terms of ethics and legality, the studies agree on the legal and ethical responsibility of researchers who use AI; accountability reinforces the legitimacy and reliability of research; and the consequences and risks require accepting the ethical and scientific implications arising from results obtained with AI; conversely, it should be noted that responsibility is typically either individual professional, or regulatory and institutional. This is consistent with the findings of Guerrero et al. (2025), who note that the integration of AI into scientific research has made significant progress, driving advancements in machine learning across various sectors, and point out that the use of AI influences the different stages of the research process, from problem formulation and hypothesis development to the dissemination of results. This reinforces the utilitarian principles of Llerena & Ayala (2025) by establishing that actions should be evaluated based on their ability to maximize collective well-being. In scientific research, this refers to the balance between the benefits of AI, that is, between discovery and efficiency.

The information supporting the fifth objective—which concerns policy proposals, standards, or governance models that guide the responsible use of AI in scientific research— highlights a regulatory approach that calls for clear policies and specific requirements to govern the responsible use of AI in scientific research. The governance model seeks to recognize the importance of transparency, accountability, and ethics. Regarding ethical principles, accountability, responsibility, and data protection are common principles across all studies; in terms of oversight and control, the use of tools that ensure ethical and legal compliance in the research process is required; regarding interdisciplinary participation, the inclusion of ethics committees, specialists, and cooperation between institutions and the government is valued; regarding adaptability and updating, it is recognized that standards must be academic and adapt to rapid technological advances; Regarding external references, the need to use existing international codes and guidelines is raised; in practical application, AI is guided toward safe, ethical, and reliable use in knowledge production; while in institutional innovation, the scientific community is required to develop its own frameworks and protocols. The data align with the findings of Llerena and Ayala (2025), concluding that the integration of AI into academia and research presents challenges and offers significant opportunities, requiring an ethical framework and clear guidelines to ensure the responsible use of AI. The findings reinforce the theory of Madanchian and Taherdoost (2025) by emphasizing the development of virtues such as justice, prudence, and responsibility in decision-makers; their application to the ethics of AI in science fosters the building of social trust and ethical governance, and is responsible for promoting responsible practices beyond mere norms or utility calculations.

VI. Conclusions

The integration of artificial intelligence into scientific research requires addressing ethical challenges related to bias, privacy, transparency, and governance, which calls for audits, clear regulatory frameworks, and human oversight, informed consent, and ethical protocols, as well as adaptable policies that ensure credibility, institutional accountability, and the safe, reliable, and responsible use of AI.

Algorithmic biases were identified, and strategies were proposed to reduce their impact on scientific outcomes, acknowledging the existence of algorithmic biases in AI and their negative impact on scientific research. Mitigation strategies based on auditing, transparency, and human oversight are proposed as pillars of ethical and regulatory frameworks. Furthermore, the importance of ethics training, collaboration, governance, and education is emphasized, as these are necessary conditions for ensuring the responsible and rigorous use of data in science.

It is important to note that ensuring the privacy and security of data used in scientific research requires protocols, standards, and ethical practices that safeguard data privacy and security from the outset. Clear legal frameworks, guidelines, and codes are needed to regulate the use of such data, curbing unethical conduct to prevent errors, manipulation, and plagiarism. Transparency and informed consent strengthen public and institutional trust and ethical governance, ensuring responsible practice.

Transparency in AI applied to science requires clear explanations of algorithms and decisions, open documentation, and traceability to validate processes and results. Trust and reproducibility strengthen scientific credibility, while technical tools enable an understanding of data generation. Dissemination and communication are essential to ensuring the quality of the knowledge produced.

Es hat sich gezeigt, dass Forscher für Entscheidungen und Ergebnisse verantwortlich sind, wenn sie KI in der Wissenschaft einsetzen, da KI weder moralisch noch rechtlich handlungsfähig ist. Um Ethik und Rechtmäßigkeit zu gewährleisten, sind kritische Überwachung, Peer-Review, Rückverfolgbarkeit und menschliche Kontrolle erforderlich. Auf diese Weise übernehmen die Autoren Verantwortung, legen Rechenschaft ab und stärken Legitimität und Vertrauen, wodurch ethische und wissenschaftliche Konsequenzen der KI vermieden werden.

Die Steuerung des verantwortungsvollen Einsatzes von KI in der wissenschaftlichen Forschung erfordert klare und spezifische Richtlinien, die von Transparenz, Ethik und Rechenschaftspflicht geleitet sind. Zu den gemeinsamen Grundsätzen müssen Rechenschaftspflicht und Datenschutz unter menschlicher Aufsicht und Kontrolle gehören. Dies gewährleistet die Einhaltung ethischer und rechtlicher Vorgaben und stärkt die Glaubwürdigkeit und Legitimität wissenschaftlicher Prozesse und ihrer Ergebnisse..

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