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The European Union and Brazil:
a brief analysis of the application of artificial intelligence in environmental protection and its global impacts

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Abstract: This research explores the potential of using artificial intelligence (AI) in environmental protection. It investigates how third sector institutions, government agencies and private corporations have implemented these technologies for ecological purposes in the European Union, and how they might be applied in Brazil. The study sought to understand how AI can be used to monitor and mitigate environmental problems, including deforestation, pollution and climate change, through techniques like real-time data analysis, satellite monitoring and predictive modeling. Furthermore, the research analyzed the impact of these initiatives on the relations between the European Union and Brazil, and how the production and application of AI technologies can influence global regulations and guidelines in a context of rising environmental denialism during Donald Trump's second term as president of the United States.

Keywords: European Union-Brazil; artificial intelligence; environmental protection; and global impacts

Introduction

Artificial intelligence (AI) has already become part of contemporary society, impacting various sectors of daily life. Generative AI tools exemplify the transformative potential of these technologies, by providing near-human interactions and innovative solutions to complex problems like environmental issues.

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Generative AI is designed to create new content, using advanced models to produce texts, images, music and various data autonomously. It is capable of simulating human creativity and create new content that can be used in various contexts, including environmental protection.

With this in mind, the private sector has been investing heavily in the development and improvement of AI algorithms. The report "Global Artificial Intelligence Study: Exploiting the AI Revolution", by PricewaterhouseCoopers (PwC) projects global investment in AI at US$ 15.7 trillion by 2030. This magnitude of investment indicates that AI will become a centerpiece in the innovation and sustainable growth strategies of corporations seeking competitive advantage.

Nevertheless, the application of AI in the public sector to date has been slow. This research aims to help fill this gap, mainly by exploring the potential of using AI for environmental purposes. In this sense, we seek to understand how this technology can be applied to monitor and mitigate environmental problems, such as deforestation, pollution and climate change, using real-time data analysis, satellite monitoring and predictive modeling. The research will also examine the impact of these initiatives on global environmental regulations and guidelines, and was carried out in light of the Philosophy of Information.

As for the structure, section one presents the employed methodology. Next, we demonstrate the quantitative results obtained from surveys of public opinion on environmental issues using the Brand24 tool. The third section addresses the theoretical foundations of the Philosophy of Information that underpins this study. In the fourth section, we report on the experiences of the European Union (EU) in using AI for environmental protection and its potential for application in other parts of the world, more specifically in developing countries like Brazil. Finally, our conclusions are presented.

1. Methodology

The qualitative approach of this research was chosen for its suitability in exploring the impacts of AI on environmental protection

and its international repercussions. We combined a quantitative analysis, including statistics on the adoption of AI in environmental practices and indicators, with a solid theoretical and practical foundation. In summary, the methodological strategy consists of a literature review complemented with case studies and quantitative data.

The literature review was carried out in IEEE Xplore and Google Scholar, where we prioritized scientific articles, systematic reviews and technical studies related to the application of AI in environmental protection and its ethical and political implications. The remaining documentary research focused on reports, official documents, publications of non-governmental, governmental and business organizations, as well as international regulations and treaties related to the topic.

The case studies analysis centered around ongoing EU efforts, such as the Emissions and Pollution Monitoring System; the Environmental Data Platform; Artificial Intelligence and Water Resource Management; Data Analytics for Environmental Policy; and Early Warning and Intervention Systems. All of these are integrated and supported by the EU's Copernicus Program.

In terms of quantitative data collection, we used the Brand24 media monitoring tool to track in real time public opinion and discussions about the use of AI in environmental protection in the EU and Brazil. This tool made it possible to identify contemporary trends and debates on social media, blogs and news sites, thus complementing the academic analysis with data from public and commercial discourse. The data collected through Brand24 was triangulated with the results of the bibliographic and documentary research, ensuring a comprehensive and well-founded analysis on the issue.

2. Results of the Data Analysis on Keywords in the Brand24 Tool for the European Union and Brazil

The results obtained from the application of the Brand24 media monitoring tool on public opinion, using the keywords "artificial

intelligence (AI)" and "environmental preservation" in the context of the EU and Brazil were:

- 58,369 mentions of the keywords, 19,397 on social media and 38,972 outside those platforms;
- On X, we found 2,358 mentions, while TikTok had 1,665 mentions;
- The remaining mentions occurred on blogs specialized in technology and the environment, news sites (BBC, CNN, Reuters), Podcasts (272) and Forums (227).

The reach of the mentions on social media was 144 million people; outside of these, another 238 million people were reached. Sentiment analysis of the keyword mentions resulted in:

- Positive sentiment: 5,192 mentions highlighted benefits or positive impacts of using AI in environmental protection;
- Neutral sentiment: 36,309 mentions; and
- Negative sentiment: 2,868 mentions associated with concerns, criticisms or problems related to the use of AI in environmental issues.

The trends identified in the material were: a) increased interest in the use of AI in sustainability initiatives like monitoring deforestation and pollution; b) discussions on ethics and privacy in the use of environmental data collected by AI; and c) expansion of the debate on the application of AI in environmental conservation projects and the prediction of natural disasters.

The main emerging themes found were: a) monitoring deforestation in the Amazon using AI; b) smart city projects that employ AI for urban environmental monitoring; and c) AI as a tool for predicting natural disasters and monitoring climate change.

The key actors involved in the discussions are: a) technology companies (Google, IBM, Microsoft); b) environmental NGOs (Greenpeace, WWF); c) academic and research institutions; and d) governments and regulatory agencies (UN, EU, Brazil).

Upon analyzing the collected data, it can be stated that they demonstrate a clear convergence between the growing use of AI in environmental monitoring and an increase in the volume of mentions of this topic. This suggests a growing interest and relevance of the subject, both in public discussions and in practical initiatives.

The positive sentiment analysis indicates a favorable perception regarding the use of AI for environmental purposes. The emerging themes and the main actors involved reflect a growing integration of AI technology in sustainability and conservation projects, as well as a focus on regulations and ethical guidelines within the EU.

To contemplate this quantitative content, in the next section qualitative analysis methods will be used, applied to information on concepts from the Philosophy of Information, such as ethics, social implications and human-machine interaction. This analysis will allow for an in-depth assessment of AI-related practices and policies, highlighting both the benefits and the ethical and social challenges. Issues such as data privacy, algorithmic bias and trust in automated decisions will be briefly examined in light of the ethical principles established by authors like Floridi (2019) and Ganascia (2010). Human-machine interaction will be explored to understand how collaboration between humans and AI systems may be optimized to achieve sustainable and fair environmental outcomes in both the European and Brazilian contexts.

3. Theoretical Foundations

Philosophy of Information is an emerging discipline that seeks to understand and articulate the role of information in different contexts. According to Floridi (2019), it investigates the nature of information,

how it is processed and used, and the ethical and social implications of these processes. This field of study is essential in analyzing how AI systems organize and interpret data, and how these interpretations impact society and the environment.

Ganascia (2010) explored the epistemology of AI from the perspective of Philosophy of Information, emphasizing that AI should be considered as an informational phenomenon that interacts with the human information ecosystem. He argues that AI can transform the way information is created and used, and that it is essential to adopt an ethical approach to ensure that this transformation is beneficial and fair.

Information ethics refers to the moral issues that arise in the collection, use, and dissemination of information, especially involving AI. This concept encompasses the responsibility to ensure that information is treated with respect and that AI systems do not perpetuate injustices or inequalities (Floridi, 2019).

Mittelstadt *et al.* (2019) and Savin (2020) discussed how information ethics should guide the development and implementation of AI technologies, ensuring that they are designed and operated in a manner that respects privacy, avoids algorithmic bias, and promotes equity.

Algorithmic bias may result in the amplification of existing inequalities by making decisions based on historical data that reflect prejudice and social injustice. This is particularly critical in environmental contexts where the application of AI affects vulnerable communities. For example, if environmental monitoring systems do not adequately consider socioeconomic data from local communities, it can result in policies that inadvertently disadvantage these populations. Therefore, it is critical that AI implementation incorporates mechanisms to identify and correct biases, thus ensuring that decisions made are fair and equitable.

Regarding data privacy, the collection and analysis of large volumes of environmental data often involves capturing sensitive information about human activities, such as consumption patterns and mobility. The way in which this data is managed, stored and used can significantly impact individuals' privacy and data security. Ethical guidelines should ensure that

data is collected in a transparent manner and with appropriate consent, and that it is protected against unauthorized access.

Human-machine interaction is a central concept in the Philosophy of Information, which analyzes how humans and AI systems can collaborate effectively and ethically. According to Floridi (2019), this interaction involves not only the use of technologies, but also the co-evolution of human and artificial capabilities. This collaboration should be designed to maximize benefits for humans and the environment, promoting an integration respectful of ethical and social values. The study of human-machine interaction is crucial to understanding how AI technologies can be developed and applied in ways that contribute to environmental protection and social justice.

The advancement of the dimension of AI in environmental protection requires international support and collaborative partnerships to improve access to technologies and the development of local human capabilities in human-machine interaction. Therefore, it is crucial to promote global initiatives for cooperation and technical support, in order to ensure a more equitable adoption of AI and to achieve the sustainable environmental goals on a global scale for the benefit of all.

Although philosophical discussions take place with reference to the practice of using AI in environmental protection, the development of such technologies has been taken up by the private sector. For example, the company Planet Labs uses a constellation of satellites to capture high-resolution images of the Earth and, in conjunction with AI algorithms, detects changes in vegetation cover with great precision. These systems allow for the early identification of illegal deforestation and the implementation of corrective measures before greater damage occurs (Planet Labs, 2024).

Additionally, Google Earth Engine has been a powerful tool in environmental analysis, using AI to process large volumes of satellite data and provide insights into climate change, air quality, and land use patterns. Studies have shown that integrating AI with satellite data can significantly improve the ability to predict and mitigate natural disasters (Google Earth Engine, 2024). Real-time data analysis has also played a

crucial role in environmental protection. NASA's Crops in Space system uses AI to monitor crop health and predict crop failures, providing valuable data for sustainable natural resource management (NASA, 2024). Another example is Microsoft's Air Quality Index, which uses AI to analyze air quality sensor data and predict pollution patterns, allowing cities to adjust their pollution control policies more effectively (Microsoft, 2024). As we can see, the implementation of AI technologies has the potential to significantly influence environmental policymaking at the international level. AI tools are increasingly being used to process large volumes of data and provide detailed analyses, enabling policymakers to develop more effective strategies based on empirical data. The problem is that these solutions are, in most cases, being developed by the private sector. Moreover, they require significant expenditures that most countries, including Brazil, cannot afford by themselves. Nonetheless, environmental protection should be part of a global effort, even though at the beginning of 2025, Donald Trump's inauguration as president of the United States has turned the country into an environmental denier.

Given this twofold difficulty, EU initiatives are becoming even more relevant to the world and Brazil in particular. This is because the EU has the economic resources and international political clout to face the challenges posed by the United States at this historic moment. It is even generating broader partnerships, including with China. In the next section, we will present some European experiences of good use of AI for environmental protection that can be internationalized in the logic of the Philosophy of Information.

4. The EU's use of AI for global environmental best practices

The EU's Copernicus program uses satellite data combined with AI algorithms to monitor emissions and air pollution patterns in real time (Copernicus, 2024). This information has been used to adjust environmental policies and respond quickly to local and regional crises,

demonstrating how AI can enable policy decisions with greater precision (UNFCCC, 2020).

The EU has adopted AI as a strategic tool to strengthen its sustainability policies and ensure compliance with environmental regulations. The integration of AI into its policies is evidenced by several projects and initiatives to effectively monitor and manage environmental issues. Examples include:

- **Emissions and Pollution Monitoring System:** The European Commission has developed advanced AI-based monitoring systems to track pollutant emissions and air quality in real time. AI is used to process large volumes of data and provide detailed information on pollution sources and their impacts (European Commission, 2024). This allows authorities to respond quickly to pollution events and adjust control policies according to local and regional needs.
- **Environmental Data Platform:** The EU has launched the European Union Environmental Data Platform, which uses AI to consolidate and analyze environmental data from different sources, including sensors, satellites and monitoring reports (European Environment Agency, 2024). This platform provides an integrated view of the environmental situation across Europe and makes it easier to identify areas that are not in compliance with environmental regulations. AI helps identify patterns and anomalies that may indicate compliance issues or areas that require urgent intervention.
- **Artificial Intelligence and Water Management:** The EU has implemented AI technologies to monitor water quality and manage the allocation of water resources. Projects like Horizon 2020 Water-IF use AI to analyze sensor data in real time and predict potential water-related crises such as droughts and pollution (Horizon 2020, 2024). This allows for more efficient resource management and rapid responses to emerging issues.

- **Data Analytics for Environmental Policy:** Researchers in Europe are using advanced technologies like artificial intelligence in conjunction with contributions from civilian scientists to monitor and protect threatened habitats and species. These tools help track changes in ecosystems and provide valuable data to support conservation policies (Horizon Magazine – European Commission, 2025).

As can be seen above, the EU's use of AI for monitoring and enforcing environmental regulations demonstrates the potential of technology to improve environmental governance and promote international cooperation. This is in line with public opinion on the topic measured in the quantitative data collection carried out using the Brand24 tool.

The EU's use of AI in environmental matters is supported by a network of its own satellites, as well as commercial and public satellite networks. As part of the Copernicus Program, since the launch of Sentinel-1a in 2014, the EU will place 20 satellites in orbit by 2030. This is a high-cost infrastructure that most countries cannot afford (Copernicus, 2024).

In other words, the adoption of AI in environmental policies, although promising, faces a number of significant challenges in developing countries, which are often linked to limitations in access, implementation and technical capacity. These challenges can create considerable disparities in the way different countries achieve global environmental goals.

Developing countries like Brazil often face difficulties in accessing advanced AI technologies due to economic constraints and lack of infrastructure. The high cost of the necessary equipment and software can be prohibitive, and many of the most advanced technologies are developed and maintained by private companies based in developed countries (ISRO, 2019).

Furthermore, even when technologies are available, the lack of an adequate infrastructure and human resources can limit their effective implementation. In Brazil, for instance, a shortage of technology experts

and a lack of adequate training have prevented a broader and more effective adoption of AI in environmental policies (Cesar et al., 2021).

These barriers to accessing and implementing AI may negatively impact the achievement of global environmental goals. Developing countries that struggle to adopt and implement AI technologies face difficulties in monitoring and reducing their greenhouse gas emissions and managing their natural resources sustainably. The lack of accurate data and limited capacity to respond to environmental crises can result in a slower progression towards global goals, exacerbate inequalities and compromе international efforts to address environmental challenges (UNFCCC, 2020).

As such, we can state that the implementation of AI in developing countries faces significant barriers related to costs, infrastructure and human resources, which can create disparities in the achievement of global environmental goals. This highlights the need for international support and collaborative initiatives to ensure a more equitable and effective adoption of AI technologies.

Against this backdrop, the EU's Copernicus program can be a model for the universalization of AI use in environmental protection, notably Brazil. Studies in the field of Philosophy of Information, specifically the ethical dimension of information, are of importance here. Copernicus may well serve as a guide to build a collaborative approach that transcends national borders, aiming to establish global standards and guidelines that promote the responsible use of AI for environmental protection.

Initiatives like the General Data Protection Regulation (GDPR) and the Regulation on Artificial Intelligence are important advances in creating a regulatory framework for the use of AI in various sectors, including environmental protection. Among other issues, both regulations require that AI systems be transparent and auditable, promote equity in access to and application of technology, and that they should not reproduce or amplify existing inequalities (European Commission, 2021).

Notwithstanding, the implementation of such laws in developing countries faces significant obstacles. It is therefore up to the EU to make

efforts from an ethical perspective of information, in a collaborative sense, with countries that have limited capacities in this area, including Brazil.

Conclusion

This study has revealed the transformative impact of AI on environmental protection, highlighting its innovative capabilities to monitor and manage critical issues like deforestation, pollution and climate change. Satellite technologies and real-time data analysis systems have enabled more accurate detection and faster responses to environmental crises. These advances demonstrate the potential of AI to provide detailed insights and proactive solutions, improving the global approach to environmental protection. The integration of AI into the European Union's environmental policies, as can be seen within the scope of the Copernicus Program, is testament to this.

The continued advancement of AI offers new opportunities and challenges for environmental protection, but also requires constant vigilance to ensure its ethical and responsible use. The integration of AI with emerging technologies (quantum computing and big data analysis) can further expand environmental monitoring and management capabilities.

However, the disparity in access to technology and capacity to implement it in developing countries raises questions about the equity of these advances. In this sense, to maximize the benefits of AI in environmental protection and ensure its ethical and responsible use, transparency and accountability must be emphasized. Clear guidelines for the collection, storage and use of data must be implemented, ensuring that AI systems respect privacy and avoid algorithmic bias. The creation of regulatory frameworks, such as the European Union's Regulation on Artificial Intelligence, can serve as a model, provided they are adapted to local needs and contexts to promote more inclusive and fair governance.

Additionally, international cooperation is essential to overcome the barriers faced by developing countries. Initiatives should be expanded to

include technical and financial support, enabling these countries to adopt and implement AI technologies effectively. Collaboration should focus on the transfer of knowledge and resources, promoting the construction of infrastructure and local human technical know-how. These actions will contribute to a more equitable adoption of AI, and a sustainable and inclusive environmental protection for all.

The collaborative and adaptive approach advocated by the Philosophy of Information literature will allow for a continuous integration of AI-based solutions into environmental protection. It is desirable that the EU becomes a hub for initiatives for the public dissemination and regulation of AI in overcoming inequalities in access and implementation of technologies to promote environmental protection. By establishing global standards and promoting international cooperation, it will be possible to ensure that AI is used in a fair and inclusive manner, thus contributing to the achievement of global environmental goals and sustainable development in all regions of the world.

Both the EU and Brazil have much to gain by cooperating in this type of initiative. Most of all, to establish a foothold in the geopolitical dispute with the United States to guarantee the use of AI for environmental protection.

References

AFRICAN DEVELOPMENT BANK. *Africa's AI Landscape*: Unlocking the Potential of Artificial Intelligence in Africa. Abidjan: African Development Bank, 2020.

BOSTROM, Nick. *Superintelligence:* Paths, Dangers, Strategies. Oxford: Oxford University Press, 2014.

BRAND24. *Brand Monitoring and Social Listening Tool*. Breslávia: Brand24, 2024. Disponível em: https://brand24.com/. Acesso em: 26 jul. 2024.

CESAR, E.; ALMEIDA, R.; SILVA, T. Desafios na implementação da Inteligência Artificial no Brasil: infraestrutura e capacitação técnica. *Revista Brasileira de Tecnologia e Sustentabilidade*, São Paulo, v. 5, n. 3, p. 45-67, 2021.

COPERNICUS. *European Union's Earth Observation Programme*. Bruxelas: Comissão Europeia, 2024. Disponível em: https://www.copernicus.eu/en. Acesso em: 26 jul. 2024.

EUROPEAN COMMISSION. *Proposal for a Regulation of the European Parliament and of the Council on Artificial Intelligence (COM(2021) 202 final).* Bruxelas: Comissão Europeia, 2021.

EUROPEAN COMMISSION. *Climate Report Shows the Largest Annual Drop in EU Greenhouse Gas Emissions for Decades*. Bruxelas: Comissão Europeia, 2024. Disponível em: https://commission.europa.eu/news/climate-report-shows-largest-annual-drop-eu-greenhouse-gas-emissions-decades-2024-11-05_pt. Acesso em: 24 jan. 2025.

EUROPEAN ENVIRONMENT AGENCY. *Environmental Data Platform DataHub*. Copenhague: Agência Europeia do Ambiente, 2024. Disponível em: https://www.eea.europa.eu/en/datahub?size=n_10_n&filters%5B0%5D%5Bfield%5D=issued.date&filters%5B0%5D%5Btype%5D=any&filters%5B0%5D%5Bvalues%5D%5B0%5D=All%20time. Acesso em: 24 jan. 2025.

FLORIDI, Luciano. *The Ethics of Information*. Oxford: Oxford University Press, 2019.

GANASCIA, Jean-Gabriel. *Epistemology of Artificial Intelligence*. Londres: Routledge, 2010.

GLOBAL PARTNERSHIP ON ARTIFICIAL INTELLIGENCE. *GPAI Principles*. Paris: GPAI, 2021.

GOOGLE EARTH ENGINE. *A Planetary-Scale Platform for Earth Science Data & Analysis*. Mountain View: Google, 2024. Disponível em: https://earthengine.google.com/. Acesso em: 26 jul. 2024.

HORIZON 2020. *Water-IF Project:* AI for Sustainable Water Management. Bruxelas: Comissão Europeia, 2024. Disponível em: https://www.h2020.net/. Acesso em: 24 jan. 2025.

HORIZON MAGAZINE – EUROPEAN COMMISSION. *Researchers combine citizens' help and cutting-edge tech to track biodiversity*. Bruxelas: Comissão Europeia, 2024. Disponível em: https://www.biodiversity.europa.eu/. Acesso em: 16 jan. 2025.

ISRO BHUVAN. *Indian Geo-Platform of ISRO*. Bengaluru: Organização Indiana de Pesquisa Espacial, 2024. Disponível em: https://bhuvan.nrsc.gov.in/. Acesso em: 26 jul. 2024.

MICROSOFT. *Air Quality Index*: AI-driven pollution forecasting. Redmond: Microsoft, 2024. Disponível em: https://www.microsoft.com/en-us/sustainability. Acesso em: 24 jan. 2025.

MITTELSTADT, Brent *et al*. The Ethics of Artificial Intelligence. *Nature*, Londres, v. 587, n. 7838, p. 38-45, Nov. 2019.

MUEHLENBACH, K. *et al*. Machine learning for forest fire risk prediction: a case study in Mediterranean Europe. *International Journal of Wildland Fire*, Collingwood, v. 30, n. 7, p. 644-655, jul. 2021.

NASA. *Crops in space:* AI for agricultural monitoring. Washington, D.C.: NASA, 2024. Disponível em: https://earthdata.nasa.gov/. Acesso em: 24 jan. 2025.

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (OECD). *AI and the Environment*: Supporting Sustainable Development. Paris: OECD Publishing, 2021.

PLANET LABS. *Daily satellite imagery and insights*. São Francisco: Planet Labs, 2024. Disponível em: https://www.planet.com/. Acesso em: 26 jul. 2024.

SAVIN, Adrian. The ethics of Artificial Intelligence. *The Journal of Artificial Intelligence Research*, Ann Arbor, v. 68, n. 1, p. 443-518, jan. 2020.

UNITED NATIONS EDUCATIONAL, SCIENTIFIC AND CULTURAL ORGANIZATION (UNESCO). *The UNESCO Framework for Ethical AI*. Paris: UNESCO, 2021.

UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE (UNFCCC). *The Paris Agreement*. Bonn: UNFCCC Secretariat, 2015.