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GLOBAL DISTRIBUTION AND CROSS-COUNTRY COLLABORATION ON DATA AND ARTIFICIAL INTELLIGENCE ETHICS RESEARCH: A BIBLIOMETRIC ANALYSIS

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ABSTRACT

Publications on data and artificial intelligence ethics have grown in importance as more international entities seek to adopt new rules and create international frameworks to manage the same. Concerns remain, however, regarding the fragmented legal landscape and the absence of a unified set of standards for big data and artificial intelligence technology. This study examines data and AI ethical publishing and citation patterns from 1996 to 2022 (26 years). It highlights the leading countries and institutions, prominent research streams, and cross-country collaboration. Bibliometric analysis has been used to extract data from the Scopus database. patterns. A title search strategy using particular keywords was used to extract 331 records. The data was exported to VOS viewer software, Biblioshiny, and Excel for a thorough scientific analysis. This study fills the gap by addressing the issue of international collaboration in data and AI ethics research, as well as cultural diversity perspectives in international studies. The findings revealed that 633 authors from 40 countries have contributed to data and AI ethics documents. This shows that only a few countries contributed to global research trends in data and AI ethics, indicating a dearth of different perspectives. Western colleges ' computer science and philosophy professors affect data and AI ethics discussions in technology and society journals. Oxford and Cambridge universities offer key viewpoints on the subject, while merely three main clusters of cross-country collaboration took place. This study highlighted the practical implications of increasing international collaboration in data and AI ethics research to create a more inclusive and equitable global framework. The study is the foundation for increased collaboration, which may dispel negative stereotypes, develop social cohesion, promote tolerance, and foster improved decision-making and problem-solving.

Keywords: Ethics, Technology, Collaboration, Culture, Policy, Diversity, Digital Divide

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A. INTRODUCTION

Owning a massive amount of data and the widespread use of AI technology render every government an enormous responsibility to provide a proper approach, regulation, and control mechanisms to avoid unethical use of data and AI technology. The apprehensions regarding data and AI ethics have led to the creation of numerous guidelines and frameworks by national and international policies globally (Franzke, 2022; Marcovitch and Rancourt, 2022). Canada pioneered this effort by launching its national AI strategy in March 2017 (Dutton et al., 2018). Further national AI initiatives showed plural institutional logic and public-private cooperation in AI governance design (Radu, 2021; Montasari, 2023). At least 175 countries, corporations, and organizations have published AI ethics documents, but these initiatives have been dispersed (Feldstein, 2023).

Ethical considerations regarding data and AI differ across regions due to varying societal perspectives. In some places like Singapore and China, concerns about surveillance may be less pronounced due to centralized governance and societal order (Hagerty and Rubinov, 2019). Conversely, political instability and corruption in countries like Venezuela can lead to resistance to monitoring efforts shaped by cultural and historical factors (Hagerty and Rubinov, 2019). The prevalence of crime and corruption within a country can also influence various entities' unethical use of data and AI (Castelvecchi, 2019). Additionally, a lack of transparency in AI decision-making (Tworek, 2019) raises ethical concerns, as does the varying implementation of privacy and security measures influenced by economic, political, and rights-related factors in different countries (Maleh et al., 2022; Singh and Light, 2019).

Cultural differences between countries can lead to conflicts between universal ethics and local values. For instance, the Moral Machine Experiment found cross-cultural ethical variance among Western, Eastern, and Southern countries (Awad et al., 2018). There is a global consensus on five ethical principles in AI: transparency, justice and fairness, non-maleficence, responsibility, and privacy, but disagreements exist regarding their interpretation and application (Jobin et al., 2019). Due to the complexity of the topic, studies viewed that data and AI ethics should be established as macroethics that avoid narrow, ad hoc approaches and address the ethical implications within a consistent, holistic, and inclusive framework (Floridi and Taddeo, 2016).

The proposed EU AI Act presents the first effort to horizontally govern artificial intelligence worldwide due to its extraterritorial applicability and likely demonstration effect for policymakers (Bharti, 2022). However, the differences in ethical concerns in data and AI research have sparked debates between different ideologies, emphasizing the need for

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collaboration (Greene et al., 2023; Borsci et al., 2023; Birchfield et al., 2023). To this effect, constructing policies on data ethics acceptable at the international level may face challenges in planning and enforcement.

Global data and AI ethics have been examined in several research. Hagerty and Rubinov's (2019) survey of fourteen nations found that culture greatly influences AI attitudes. However, regional differences have been overlooked, underscoring the need to advance the global data and AI ethical discourse (Von Ingersleben-Seip, 2023; ÓhÉigeartaigh et al., 2020). Lack of ethical plurality in data and AI ethics conversation could lead to a standstill on universal standards (Puthur et al., 2023). Without these standards, regional and cultural ethical inconsistencies and conflicts may occur.

Research suggests that regulatory cooperation and joint research and development projects can improve global AI standards (Von Ingersleben-Seip, 2023; Khan et al., 2022). Data and AI ethics must be discussed globally since societies have varied ethical languages, understandings, and expectations (Hagerty and Rubinov, 2019). International collaboration can build ethical AI, enable trade for AI-powered products and services, unleash AI's promise to tackle global difficulties, and defend democratic regimes and ideals through shared principles and mutually reinforcing regulations (Kerry et al., 2021). Cross-country collaboration facilitates the exchange of technology, expertise, resources, and best practices among countries while simultaneously acknowledging and respecting their distinctiveness (Parthasarathy et al., 2023; Di Cara et al., 2022). This speeds up progress and ensures data and AI applications can navigate multiple jurisdictions with appropriate regulations (Cihon 2019). Lack of collaboration can lead to ineffective responsible data and AI practices, unnecessary trade and innovation hurdles, a fragmented internet, and an incoherent alternative to digital dictatorship (Wiesmüller and Bauer, 2023; Kerry et al., 2021).

Fostering cross-cultural cooperation on AI ethics and governance is essential for effectively bridging cultural mistrust and coordinating efforts (ÓhÉigeartaigh et al., 2020; Wong, 2020). This involves engaging global stakeholders to establish practical standards and regulations and partnering with researchers from diverse countries for responsible AI development. Joint academic research projects are pivotal in enhancing mutual understanding and incorporating diverse cultural perspectives to achieve consensus among nations (ÓhÉigeartaigh et al., 2020; Teferra et al., 2022). Rigorous academic research also contributes to policy solutions addressing data and AI ethics challenges (Winter, 2018). Hence, an analysis of international scholarly conversations on data and AI ethics is necessary due to global data consumption and AI use.

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No previous bibliometric study has examined international collaboration in data and AI ethics research. Bibliometric analysis, which relies on statistical assessments of research and publication activities, provides a systematic, repeatable, and transparent evaluation procedure (Aria and Cuccurullo, 2017) to evaluate this, which tends to be more objective and reliable. Current bibliometric studies have mainly focused on AI research trends and their impact in various fields (Santo Faria et al., 2023; Chuang et al., 2022; Gao and Ding, 2022) To address this research gap, this study aims to explore global collaborative trends among data and AI ethics researchers using bibliometric attributes, filling a crucial gap in the existing literature.

1. Objectives of the study

This paper presents a bibliometric analysis of scientific literature on data and AI ethics by looking into three primary research objectives:

a. to identify the leading countries and institutions contributing to the literature on data and AI ethics.
b. Analyze the primary research streams on data and AI ethics literature.
c. to investigate the patterns of cross-country collaborations in the data and AI ethics literature.

The source of perspectives, the influential views, and the data on international research cooperation are necessary to provide insights into global trends and priorities when incorporating diverse viewpoints on data and AI ethics. Information about the origin of data and AI ethics perspectives; the key influential research streams and to what extent it has considered different economies, cultural and political dimensions of the source of data itself as well as the extent of global collaborations being done towards such initiatives would be helpful towards better coordination effort in the issue. Such information could assist in coming up with possible recommendations for future research in the development of data and AI ethics.

2. Methodology

This quantitative study used bibliometric patterns on data obtained from the Scopus database to achieve the desired objectives. We chose the Scopus database since it contains more than 1.8 billion cited references dating back to 1970 and is among the largest abstract and citation database of peer-reviewed literature, delivering global content of more than 6000 titles from North America, over 750 titles from the Middle East and Africa, over 11000 titles from Western Europe, over 1,400 titles from East Europe including Russia, over 700 titles from Latin America, over 2000 titles from the Asia Pacific as well as over 300 titles from Australia and New Zealand (Elsevier, n.d). With such a vast database, it is possible to get a full picture

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of global research output.

B. RESULTS AND DISCUSSIONS

1. Keyword selection

We start analyzing data and AI ethics literature by first outlining the main goals and parameters of the review. Following the formulation of the objectives, the study establishes a combination of keywords for the search code. The final keywords were selected based on a literature review, analysis of common keywords from Scopus, and researchers' prior knowledge. We finally use the following search query: ("data ethic*" OR "digital ethic* OR "AI ethic*" OR "artificial intelligence ethic*" OR "machine ethic*"). This search code facilitates identifying articles to be included in the analysis.

Considering all the keywords offers a comprehensive perspective on the ethical aspects of digital technologies. Data ethics and AI ethics are linked yet distinct. Data ethics addresses data, algorithms, and practice ethics (Parthasarathy et al., 2023). Data is used responsibly in decision-making and wealth development (Lemke et al., 2023). However, AI ethics addresses the ethical consequences of AI-based technologies and AI itself (Slota et al., 2022). AI ethics incorporates meaning-making through data and algorithms and is guided by personal and professional values (Slota et al., 2022). The interconnectedness between data ethics and AI ethics can sometimes blur boundaries, as ethical issues in AI often stem from the underlying data and its use. Hence, it is common for discussions on AI ethics to consider data ethics as well. Data ethics, which includes AI ethics, is necessary for ethical data and AI use (Marcovitch and Rancourt, 2022).

Comparatively, machine ethics is a subdiscipline of AI ethics that deals specifically with the ethical behavior of autonomous machines (Nath and Sahu, 2020). It is particularly critical in contexts like autonomous vehicles, medical decision-making systems, and military robots, where machines must make ethical decisions impacting human lives. In essence, machine ethics focuses on ensuring ethical machine behavior. On the other hand, AI ethics addresses broader ethical concerns surrounding AI development, deployment, and usage within the broader field of digital ethics (Hanna and Kazim, 2021). Digital ethics and AI ethics are interconnected, and addressing both in a single paper can provide a more comprehensive view of the ethical considerations of digital technologies. Digital ethics encompasses many issues, including privacy and digital inclusion, whereas AI ethics examines explicitly the moral implications of AI and machine learning. Although there is some overlap, each field has its unique focus and should be considered in shaping ethical guidelines for technology.

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2. Data Extraction And Filtration Process

We conducted a title search on March 25, 2022, using the keywords in the Scopus online database. We specifically focused on titles to ensure a more precise and relevant search. Including abstracts and keywords might have generated more irrelevant results, making identifying and analyzing the most relevant documents challenging. By limiting our search to titles, we could compare and analyze documents based on concise and standardized information. However, we acknowledge that this approach may have limitations, as some relevant documents may have been excluded by not considering abstracts and keywords in our search.

We comprehensively searched the Scopus database, considering all document types, time frames, languages, source types, and subject areas. The specific search code yielded 331 documents published between 1996 and 2022, marking 1996 as the first year Scopus published articles related to ethics and data-driven technologies. After manual screening, all 331 documents were found to be relevant and thus included in the bibliometric analysis. These results were saved and exported to R-tool bibliometrics (Aria and Cuccurullo, 2017), an open-source, comprehensive science mapping analysis tool. Several results from the R-tool were then exported to a new Excel file.

3. Data Analysis

From this newly created file, we examine factors such as document types, publication year, authorship, journal of publications, institutions, and country scientific production. Specific bibliometric techniques, such as co-citation analysis, bibliographic coupling, and co-authorship analysis, were used to synthesize the findings. These techniques allowed us to identify the collaborative trends within the literature and the most productive source titles and influential authors and publications in the area. These data developed further information like percentages, charts, figures, and analysis. After the results were identified, analyzed, and synthesized, we drew up the final report, which presents the findings and analysis of the materials. This paper hopes to contribute meaningful insights into the trend of data and AI ethics research at the global level. Researchers can use the findings as a springboard for future studies and conversations to further enhance and improve this field.

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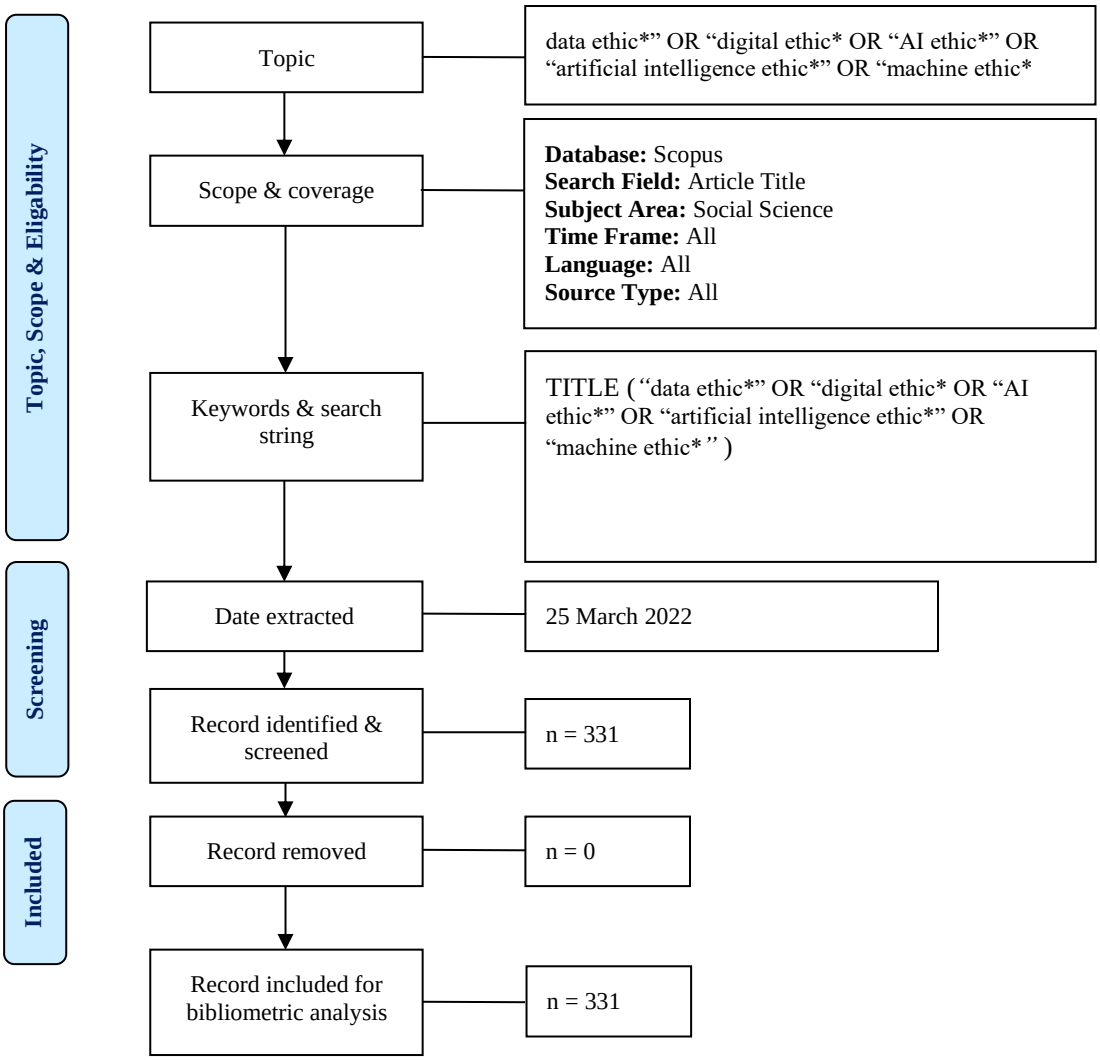

Figure 1. *Flow Diagram of Search Strategy*

4. Demographics

Description	Results
MAIN INFORMATION ABOUT DATA	
Timespan	1996:2022
Sources (Journals, Books, etc)	197
Documents	331
Average years from publication	3.96
Average citations per documents	8.474
Average citations per year per doc	1.536
References	10691

Table 01. *Main Information About the Documents Published on Data and AI Ethics in the Scopus Database.*

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Table 1 presents the main characteristics summarizing the dataset of 331 documents published on data and AI ethics in the Scopus database retrieved from 1996 until 2022. The average number of citations per document was 8.48, and the average number of citations per year per document was 1.53, with 10,691 references.

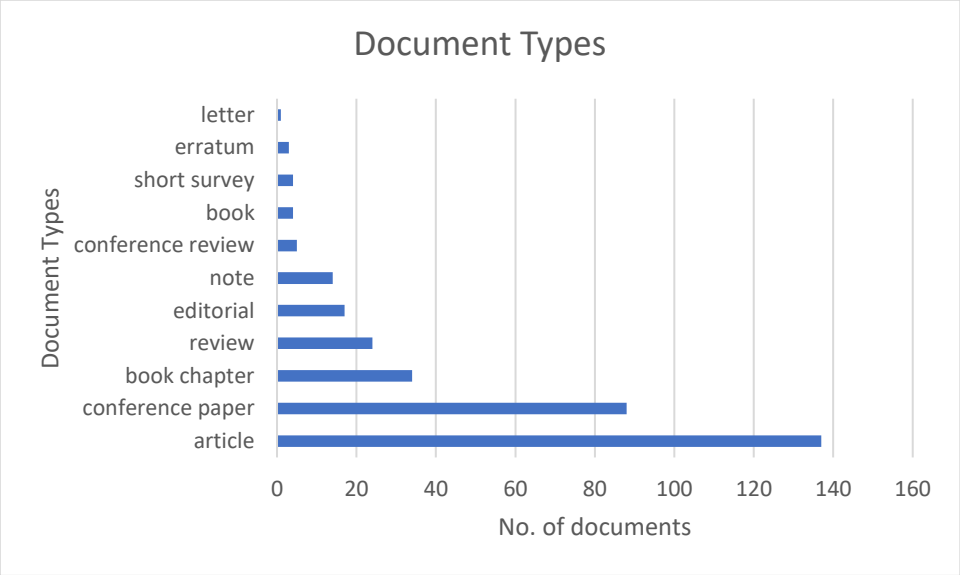

Figure 02. *Types of Documents Dealing with Data and AI Ethics*

Figure 2 presents the types of documents dealing with data and AI ethics. Out of the 331 documents, most were articles (n=137), followed by conference papers (n=88). The rest of the documents were in various forms: book chapters, reviews, editorials, notes, conference reviews, books, short surveys, erratum, and letters.

AUTHORS	**Results**
Authors	633
Author Appearances	739
Authors of single-authored documents	135
Authors of multi-authored documents	498
AUTHORS COLLABORATION	
Single-authored documents	158
Documents per Author	0.523
Authors per Document	1.91
Co-Authors per Documents	2.23
Collaboration Index	2.88

Table 02. *Authors Information*

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Table 2 presents author information as well as author collaboration. There are 633 sample authors, with 135 authors contributing single-authored articles and 498 authors contributing multi-authored articles. 158 (47.7%) of the total 331 articles are single-authored. The collaboration index, which is only 2.88, reflects the collective effort.

5. Highly Productive Countries

Rank	Country	Total of articles
1	USA	219
2	UK	109
3	Germany	42
4	Canada	27
5	China	27
6	Australia	24
7	Finland	24
8	Netherlands	23
9	Italy	18
10	Portugal	18

Table 03. *The Top 10 Most Productive Countries in Terms of Scientific Production of Data and AI Ethics Literature*

Table 3 reveals the most productive countries in data and AI ethics-related studies. Two nations are responsible for many of the data and AI ethics documents produced. The United States leads by far with 219 documents, followed by the United Kingdom with 109 documents. Other countries are far behind in producing data ethics scholarly work with less than 50 documents, namely Germany (n=42), Canada (n=27), and China (n=27). Among these countries, only China is in Asia, while the remaining nations are in North America, Europe, and Oceania.

The major countries revealed from the data also commensurate with Chakravorti et al. (2019) study that ranks the US, UK, China, Switzerland, South Korea, France, Canada, Sweden, Australia, and the Czech Republic as the top data producers. Similarly, it supports the research on the global distribution of codes for responsible AI (Jobin et al., 2019), which found that developed countries are the primary source of these codes, with no participation from countries in Africa or South America. This finding is understandable as most data and AI technology are centered in the US, Europe, and China and designed by people from similar backgrounds.

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Developing nations have limited capacity for these technologies for their domestic economies. Thus, not much discussion on data and AI ethics may arise from such areas. Such an imbalanced position may also imply that the "ethics" guiding digital technologies are intrinsically prejudiced and that many recommendations for data and AI ethics could overlook a significant portion of the world's diverse cultures and ways of being (Applin, 2019). This is concerning because primary data and AI technology developers from foreign social, political, and economic backgrounds may have biases in their established parameters or labels. The advancement of technology may potentially increase social instability and pose greater risks to disadvantaged populations, amplifying global inequity. Thus, involving non-Western perspectives in determining acceptable global data and AI ethics is important.

6. Countriy Scientific Production

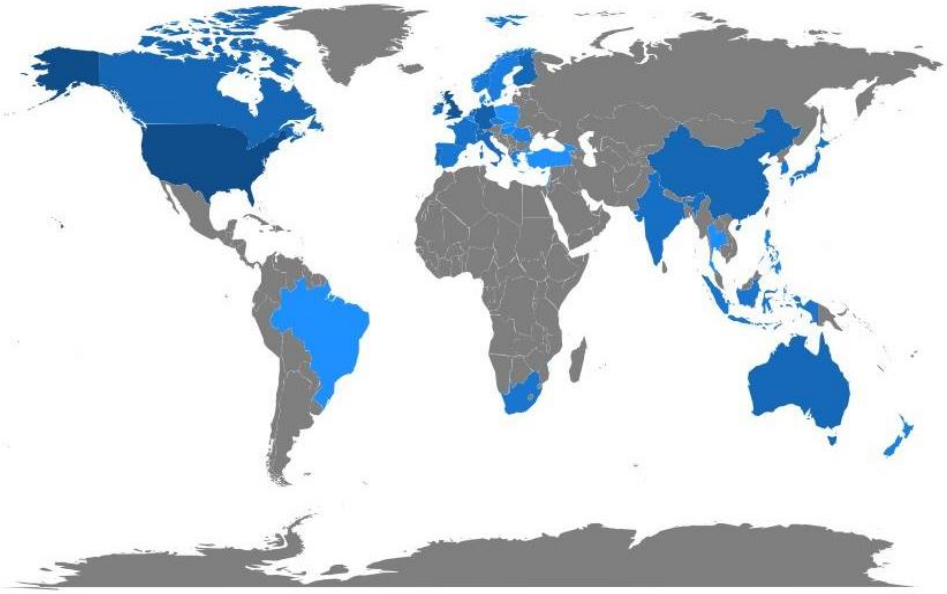

Figure 03. Country Scientific Production in Terms of Data and AI Ethics Literature

Figure 3 shows the country's scientific production in data and AI ethics literature by displaying the frequency of publication of data ethics-related documents by color intensity. The darker the color, the higher the number of publications produced by the particular country. Authors from 40 different countries have provided documents on data and AI ethics. This is barely 20% of the 193 nations that adopted the 2021 UNESCO Recommendation on the Ethics of AI (UN News, 2021), the first global framework articulating relevant principles and shared values for a healthy domestic development of artificial intelligence.

The above data must also be weighed against the number of researchers per million persons in the area. Countries with many researchers per million, such as Switzerland, the United States, the United Kingdom, Sweden, and the Netherlands, may produce more research

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and publications ("How leading nations fare on applying knowledge," 2022).

Roche et al. (2021) similarly found that AI ethical discourse underrepresents countries in the global south, which may contribute to discrimination and marginalization. Inadequacies in research skills, English language competency, scientific networks, access to research funds and travel grants, and the effect of an exclusive culture in the area may also be to blame (Amarante et al., 2022). Excluding Southern researchers from academic discussions restricts the richness and diversity of these debates and perpetuates the disproportionate influence of Northern scholars in the field where Southern researchers possess valuable first-hand experience (Amarante et al., 2022).

This study supports the notion that there is a lack of worldwide equality (Jobin et al., 2019) in the treatment of data and AI ethics. The most developed economies influence the conversation by neglecting local expertise, cultural diversity, and international fairness. Fundamentally, ethical decision-making is confined to a narrow group of countries, disregarding cultural diversity, normative perspectives, and the full complexity of ethical analysis.

7. Top Most Cited Countries

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Country	Total Citations	Average Article Citations
United States of America	947	22.55
United Kingdom	541	14.62
Germany	194	14.92
Canada	94	9.40
Italy	49	12.25
Netherlands	22	2.44
Sweden	21	7.00
Australia	18	2.57
France	16	5.33
Switzerland	15	3.75

Table 04. *The Top 10 Most Cited Countries in Terms of Publications on Data and AI Ethics*

Table 4 presents the top 10 most cited countries in terms of publications on data and AI ethics. It points out that the United States obtained the most significant number of overall citations (n=947). This is followed by the UK (n=541) and Germany (n=194). All the remaining top 10 countries, namely Canada, Italy, Netherlands, Sweden, Australia, France, and Switzerland, have a total citation count of fewer than 100 citations.

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8. Top Institutions

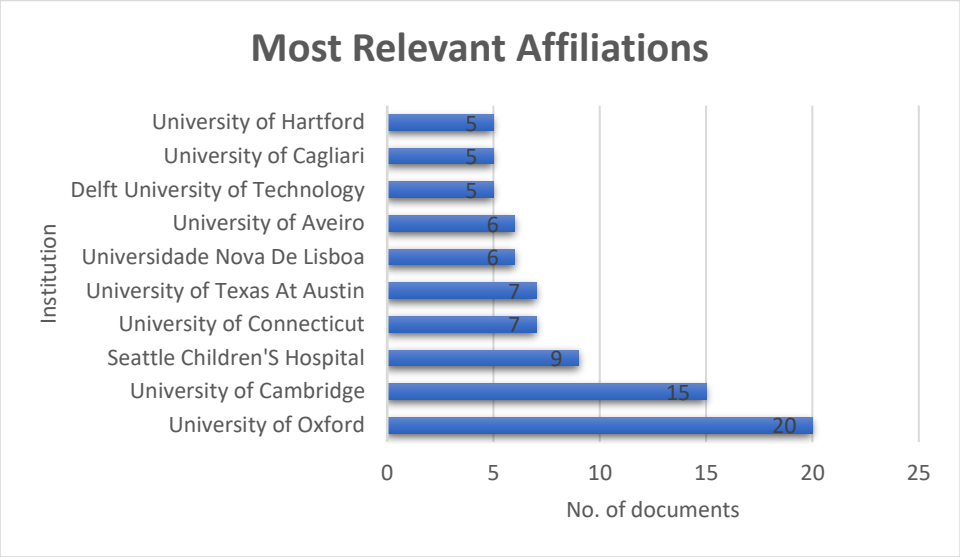

Figure 04. *Top 10 Institutions Contributing to the Publications on Data and AI Ethics*

In total, 253 different affiliations are indicated in the data ethics publications. Figure 3 depicts the ranking of the top ten affiliations regarding the amount of data and AI ethics-related documents published in the Scopus database. The most significant number of articles are from the University of Oxford, with 20 documents, followed by the University of Cambridge (n=15). Both universities are among the oldest universities in England. Oxford University has seriously attempted to lead the way in AI ethics when it established an Institute for Ethics in AI launched in February 2021. The institute aims to contribute to the ethics and governance of AI by bringing together world-leading philosophers and experts from the humanities, technology, and users.

The finding also implies that institutions from developed countries like the United Kingdom and the United States of America are the most productive in contributing to publications on data ethics. However, the shares of publications also spread over institutions coming from other countries, such as Universidade Nova De Lisboa and the University of Aveiro, both from Portugal, as well as the Delft University of Technology from the Netherlands and the University of Cagliari from Italy. A project by Algorithm Watch (2019) mapping and landscaping the AI Ethics frameworks found common traits where most frameworks are developed institutions that later involve others through invitations. The aspiration to embed data ethics within multidisciplinary courses and demographically diverse students (Reeve et al., 2022) may be hampered.

Research and publishing output is closely tied to the availability of funded graduate

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programs, fellowships, and postdoc positions, which well-established universities often provide. (Naddaf, 2022). This may result in prejudice, inequality, and exploitation in knowledge dissemination. The need for decolonized research was seen as something scientific institutions and donors could help with (Gewin, 2022b). Decolonization should go beyond just citing colleagues from underdeveloped nations and involve including them as co-authors and conference participants, mainly when jointly producing knowledge. (Gewin, 2022a).

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9. Most Influential Sources and Documents on Data and AI ethics

Source Title	Total Publications	
	No.	%
AI and Society	16	5%
CEUR Workshop Proceedings	11	3%
Lecture Notes In Computer Science (Including Subseries Lecture Notes in Artificial Intelligence And Lecture Notes In Bioinformatics)	10	3%
Philosophy And Technology	10	3%
Machine Ethics	7	2%
Journal of Information Communication And Ethics In Society	6	2%
Minds And Machines	6	2%
ACM International Conference Proceeding Series	5	2%
AIES 2021 – Proceedings Of The 2021 AAAI/ACM Conference on AI Ethics And Society	5	2%
Science And Engineering Ethics	5	2%
Zygon	5	2%
IEEE Intelligent Systems	4	1%
Machine Ethics And Robot Ethics	4	1%
Nature	4	1%
Philosophical Transactions of The Royal Society A: Mathematical Physical And Engineering Sciences	4	1%
Rethinking Machine Ethics In The Age Of Ubiquitous Technology	4	1%
AAAI Workshop – Technical Report	3	1%
AIES 2018 – Proceedings of The 2018 AAAI/ACM Conference On AI Ethics And Society	3	1%
AIES 2020 – Proceedings of The AAAI/ACM Conference On AI Ethics And Society	3	1%
AISB/IACAP World Congress 2012: Moral Cognition And Theory of Mind Part of Alan Turing Year 2012	3	1%

Table 05. *Top 20 Most Productive Source Titles on Data and AI Ethics*

Documents on data and AI ethics have been published in 197 different titles, which is hardly impressive. Table 5 presents the top 20 most productive source titles, demonstrating their productivity in publishing articles on data and AI ethics. The percentage values refer to

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the total of 331 publications. The journal AI and Society is at the top of the list, with 16 documents published on data ethics. This is understandable, given that the Journal of AI and Society explores the philosophical, ethical, and economic implications of information, communications, and new media technologies. Hence, the discussions on technology and society are very much related to data ethics and thus suit well within the scope of the journal. Other most relevant source titles on the topic of data ethics are CEUR Workshop Proceedings (n=11), Lecture Notes In Computer Science (Including Subseries Lecture Notes In Artificial Intelligence And Lecture Notes In Bioinformatics (n=10), and Philosophy And Technology (n=10). This shows that the discussion of data and AI ethics mainly revolves around journals focusing on technology. Thus, scholarly communities from other fields, such as social and behavioral sciences, may lack the understanding or consideration of such important discussion.

10. Highly Cited Documents

Highly cited documents may represent the crème de la crème of ideas, national and regional researchers, evoking the pinnacles of national and regional knowledge innovation. Highly cited publications indicate that the research findings have been extensively acknowledged, inherited, and carried forward by subsequent generations of researchers.

Author(s)	Paper	Document Title	LC	GC	%	NLC	NGC
Anderson, M., & Anderson, S. L (2006)	Guest Editors' Introduction: Machine Ethics	IEEE Intelligent Systems	53	31	17 1	2.2	0.3
Moor, J. H (2006)	The nature, importance, and difficulty of machine ethics	IEEE Intelligent Systems	34	29 2	11. 6	1.4	2.5
Anderson, M., & Anderson, S. L. (2007)	Machine ethics: Creating an ethical intelligent agent	AI Magazine	21	19 6	10. 7	1.8	1.9
Floridi, L., & Taddeo, M. (2016)	What is data ethics?	Philosophical Transactions. Series A, Mathematical	19	14 5	13. 1	13.3	11.5

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		, Physical, and Engineering Sciences					
Hagendorff T (2020)	The ethics of AI ethics: An evaluation of guidelines	Minds and Machines	17	166	10.2	27.4	22.2
Zwitter A (2014)	Big data ethics	Big Data & Society	12	143	8.4	4.6	5.8
Floridi L (2019)	Translating Principles into Practices of Digital Ethics: Five Risks of Being Unethical	Philosophy & Technology	11	61	18.0	17.8	8.0
Brundage, M. (2014)	Limitations and risks of machine ethics	Journal of Experimental & Theoretical Artificial Intelligence	9	36	25.0	3.4	1.5
Allen, C., Wallach, W., & Smit, I. (2006)	Why Machine Ethics?	IEEE Intelligent Systems	9	140	6.4	0.4	1.2
Morley, J., Floridi, L., Kinsey, L., & Elhalal, A. (2020)	From What to How: An Initial Review of Publicly Available AI Ethics Tools, Methods and Research to Translate Principles into Practices	Science and Engineering Ethics	8	79	10.1	12.9	10.6

Table 06. *Top 10 Most Locally Cited Documents Among the Scientific Contributions on Data and AI Ethics*

Note: LC= Local Citations; GC= Global Citations; %=LC/GC Ratio; NLC=Normalized Local Citations; NGC=Normalized Global Citations.

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Table 6 shows the top 10 most locally cited documents among the scientific contributions on data and AI ethics. The most locally cited documents (LC) are calculated internally based on the number of citations received by a particular document from the documents within the dataset or the collection of the 331 documents only. Global cited documents (GC) are calculated based on the number of citations received by a particular document from all the documents around the world that have been indexed from a similar data source. Often, the longer a piece has been available, the more citations it receives.

Based on the Scopus database, Table 6 reveals that the article on machine ethics by Moor (2006) (n=292), followed by Anderson & Anderson (2007) (n=196), has the highest total citations globally. Moor (2006) discusses machine ethics' nature, importance, and difficulty, explores several ethical features of machines, and argues that a more profound knowledge of ethics, machine learning, and cognition are required to build machines as ethical agents. The author, James H. Moor, is the Daniel P. Stone Professor of Intellectual and Moral Philosophy at Dartmouth College, who is among the pioneering theoreticians in the field of computer ethics and is also the editor-in-chief of Minds and Machines (2001-2010). Anderson and Anderson (2007) further discuss the main challenges in ensuring a machine functions autonomously and forging a dialogue between ethicists that may clarify the fundamental principles of ethics and researchers that can convince the public that ethical machines can be created. Professor Michael Anderson teaches computer science at the University of Hartford, while Professor Susan Leigh Anderson teaches philosophy at the University of Connecticut. They both were instrumental in establishing machine ethics as a legitimate field of study and are highly regarded scholars.

Other highly cited documents on data ethics were published approximately a decade later, particularly by Floridi and Taddeo (2016) (n=145) and Zwitter (2014) (n=143). Floridi and Taddeo (2016) investigate moral issues associated with data, algorithms, and accompanying practices in order to design and support morally beneficial solutions. They emphasized the importance of ethical analyses to concentrate on the content and nature of computational operations rather than the variety of digital technologies that enable them. It also acknowledges the complexity of the ethical challenges posed by data science and recommends that ethics be developed as macroethics within a consistent, holistic, and inclusive framework (Floridi and Taddeo, 2016). Floridi (2019) identified five unethical risks encountered in the international debate about digital ethics when translating ethical principles into practices, which include ethics shopping, ethics bluewashing, ethics lobbying, ethics dumping, and ethics shirking. Luciano Floridi is a Fellow of St. Cross College, Oxford, and a Professor of

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Philosophy at the University of Hertfordshire, as well as the holder of the Research Chair in Information Philosophy and the UNESCO Chair of Information and Computer Ethics. Floridi co-authored with Mariarosaria Taddeo, also affiliated with the University of Oxford. Zwitter (2014) discussed the shifting nature of power towards significant data stakeholders, specifically prominent data collectors, demonstrating the emergence of ethical issues such as privacy, group privacy, propensity, and a lack of research ethics in society, politics, and research due to technological changes.

Around four years later, the topic of AI ethics (Hagendorff, 2020) was published and highly cited. Hagendorff (2020) found that AI ethics fails in many cases as it lacks reinforcement mechanisms and mainly serves as a marketing strategy. Hagendorff (2020) viewed that the ethical approach must shift from deontological, action-restricting, and based on universal abidance of principles and regulations to situation-sensitive, based on virtues and personality dispositions, knowledge expansions, responsible autonomy, and freedom of action. Thilo Hagendorff studied philosophy, cultural studies, and German literature and works as a research associate at the International Centre for Ethics in the Sciences and Humanities and lectures at the University of Tuebingen. Other frequently cited documents include articles by Allen et al. (2006), Morley et al. (2020), Florida (2019), and Brundage (2014).

The progression from machine ethics to data ethics to AI highlights the complexity and interdisciplinary nature of ethical problems in rapidly advancing technology and AI. Interestingly, the most quoted articles emphasize technological experts' concerns and the need for more stakeholder collaboration. Most writings come from Western philosophers and computer scientists. Additionally, the top 10 most authoritative articles were published in the top most productive journals in the field: IEEE Intelligent Systems, Minds and Machines, and Philosophical Transactions. Series A, Mathematical, Physical, and Engineering Sciences; Science and Engineering Ethics (Tables 5 and 6). This further highlights the need for a more diverse approach (Sartori and Theodorou, 2022) to address future development, public debate, and policy.

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11. Cross-Country Collaborations

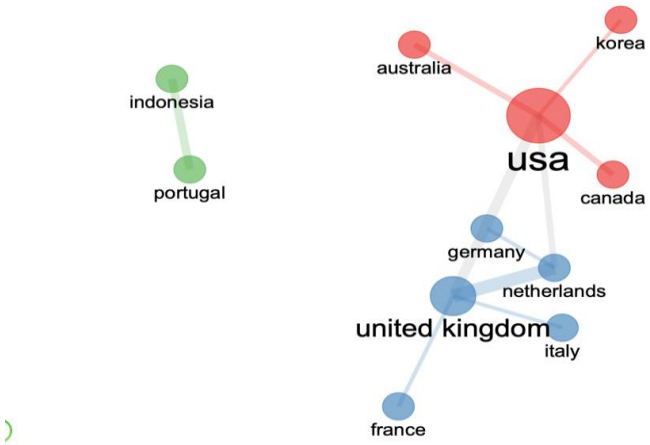

Figure 05. *Collaboration Network By Countries in Terms of Data and AI Ethics Literature*

Figure 5 illustrates the collaboration network by country regarding data and AI ethics literature. The collaboration is presented in a network where nodes represent actors and links connecting the nodes represent the co-authorship or scientific collaboration between two or more authors in scientific publications. The network shows that there are only three clusters of collaboration among countries. The United Kingdom, Italy, Netherlands, Germany, and France are in the blue collaboration cluster. This shows that the data or AI ethics research collaboration was mainly focused on the European Union area. Cooperation within the same region may be established due to the common practice, policy, and regulation governing the issue in the region, which leads to closer relationships and collaboration between the authors.

Interestingly, the second collaboration cluster in red, involving the USA, Canada, Australia, and Korea, shows that the issue of data and AI ethics is not necessarily a regional concern per se but is global. Meanwhile, the collaboration cluster in green between Indonesia and Portugal similarly shows that the study on data ethics reached across political stances, economic standing, cultures, borders, and the background of the countries.

The lack of international cooperation in data and AI ethics research can be attributed to geopolitical differences (Tang et al., 2022), mistrust and misunderstandings between cultures (ÓhÉigeartaigh et al., 2020), varying institutional structures and communication challenges (Von Ingersleben-Seip, 2023). Other factors may also involve limited incentives, data-sharing concerns, disparities in resources, language barriers, regulatory complexities,

Any differences between nations, such as the attitudes towards surveillance or individual privacy rights, should be met with intercultural competence and sensitivity (Karpa et al., 2022; Hassan et al., 2020). Disregarding cultural differences can result in

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miscommunications and erroneous interpretations of ethical principles, impeding progress. This is where international collaboration on data and AI ethics publications and scholarly works can play an important role and must be encouraged.

International cooperation on data and AI is important since it can help achieve commonly agreed principles and build trust, avoid divergent approaches that may create barriers to innovation and diffusion, and increase the potential to address global challenges (Kerry et al., 2021; Tidjon and Khomh, 2023). Engaging in more discussions across cultures and philosophical perspectives can help avoid intellectual domination and establish universally accepted norms (Goffi, 2021; Wahid, 2023).

Cross-country collaboration, which may be achieved through research publications and debates on ethical guidelines that consider different cultural constructs between regions or groups of people, will assist in managing data and AI ethics. Simultaneously, the interconnected world and its significant data consumption require common ground to promote inclusive and global dialogue and to understand shared ethical values and virtues worldwide. The universally accepted framework of international human rights law can be a starting point for the effort toward acceptable global principles on data ethics.

12. Limitations of This Study

The current bibliometric analysis is based on the "data ethic*" OR "digital ethic* OR "AI ethic*" OR "artificial intelligence ethic*" OR "machine ethic" title search query in the Scopus database only. Thus, it does not consider documents of the same subject matter which do not use these terms in its title. It is challenging to cover the entire field of research in a single review study, as various writers may use different terms or wording in their paper titles. However, the decision to use a title search with the keywords ensured that only documents related to the subject matter were considered for analysis. Thus, some articles relevant to data ethics are likely not considered in this review. Nevertheless, the findings gathered from this study are expected to reflect the trends in this research area.

13. Research Implications

A minimal number of countries have contributed to data and AI ethics research, indicating a significant dearth of diverse perspectives in this crucial area. This suggests that ethical considerations and discussions surrounding data and AI technologies may be slanted toward the perspectives and concerns of a small number of nations. This study thus emphasizes the necessity of actively involving and engaging researchers from a wider variety of nations to ensure a more comprehensive and culturally diverse approach to data and AI ethics.

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Moreover, the influence of computer science and philosophy professors in Western colleges, especially Oxford and Cambridge, indicates the dominance of specific academic and geographical perspectives on discussions of data and AI ethics. This observation suggests that the ethical frameworks and principles regulating data and artificial intelligence technologies may be Western-centric. It is essential to recognize and address this influence to establish a more inclusive and equitable ethical framework on a global scale.

Identifying only three significant cross-country concentrations collaboration reveals an area with untapped potential. Encouraging and facilitating a more extensive collaboration between researchers from various nations can result in a more prosperous and more diverse set of perspectives regarding the development of data and AI ethics. This can contribute to a more comprehensive comprehension of these technologies' ethical challenges and opportunities.

C. CONCLUSION

In this study, we discuss the data and AI ethics research in terms of its representation or global delineation. Based on a title search using specific keywords in the Scopus database in March 2022 and R bibliometrics tool analysis, we looked into the publication distribution of countries and institutions, the most influential sources and articles, and to what extent cross-country collaborations on data and AI ethics research exists. The analysis shows a wealth of discussion and knowledge from a handful of countries that also hold the data economy. The US and the UK have emerged as major contributors to the advancement of data and AI ethics research. Most publications on data ethics originated from the developed nation’s institutions and were influenced by Western authors. The University of Oxford and the University of Cambridge are the top institutions producing documents on data and AI ethics, implying that these institutions are seriously leading the way. We provide a detailed discussion of influential documents on the knowledge of data ethics. The influential documents have orientated from mere concern towards a more practical framework or approach to data ethics.

Nevertheless, data and AI-driven technologies exacerbate social gaps and inequality, especially in poor and middle-income countries. This makes these regions more susceptible to the negative than the sound effects of these technologies. A global understanding of AI and data ethics has been neglected, resulting in significant gaps in our understanding of the global social impacts of these technologies. To investigate data and AI ethical perceptions across cultures, rigorous independent ethnographic research is required. The patchiness of scholarly debate involving different nations indicates that specific perspectives from developing nations are understudied. We thus emphasize the need for more collaboration to address the diversity

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between nations and improve our understanding and management of data and AI ethics at the global level.

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