



Bibliometric insights into artificial intelligence's ethical and social dynamics

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ABSTRACT

This present bibliometric study aims to evaluate the extent of knowledge on the ethical and social aspects of artificial intelligence (AI) based on publications to be published within 2014-2024. Therefore, the present paper identifies some of the largest and most pressing trends and problems in the field of AI ethics and its social impact based on the analysis of 234 publications retrieved from the Scopus database. After analyzing the result of the literature review of the hereby presented publications, it is possible to state that the number of publications has been gradually increasing in the recent years and it can be linked to the interest and research activities. They focus on the beautiful things and the main tasks of a researcher within the given topic of interest. A similar observation made during the authorship analysis had to do with the fact that scholars and research groups have been the ones proactively building the AI ethics. From a geographical perspective, it expounds on the nations that are participating and have crucial engagement in the study area within this domain. This study also considers several aspects like is it more about the relative frequency in the cited journals to AI ethics and universities that are more organizationally involved. Consequently, this bibliometric analysis aims at offering an overview of the current state of knowledge regarding the ethical and social implications of AI. Therefore, the present work contributes to the. As has been seen, results from qualitative studies enrich the body of literature extending the current quantitative analysis in the related field.

Keywords: artificial intelligence, ethical implications, social implications, bibliometric analysis

INTRODUCTION

Artificial intelligence (AI) ethics covers the ethical issues that come about from the use of AI in fields like marketing usage of big data, and social robotics. These are some of the ethical questions that surround the application of AI; privacy violations, individual unfair treatment and social effects, hence the current call for an ethical framework for AI (Hermann, 2021; Huang et al., 2023; Ryan et al., 2021). The AI ethics field is similar to a critical theory which seeks to identify pathologies within society and to help people liberate themselves from the oppressive aspects of power relations in AI deployment (Waelen, 2022). Furthermore, the embedding of AI into social robotics raises questions in terms of social agency and human-robot interactions, which demands the philosophical consideration in various fields to contemplate the AI's possibilities of reshaping sociality (Constantinescu & Crisp, 2022; Rodogno, 2016). Thus, these interdisciplinary collaborations underline the need to tackle ethical and social issues in AI to enable the right integration of AI into society (Wamba & Queiroz, 2021).

It has the following ethical and social factors that are fundamental for one to comprehend AI. AI ethics has become an active area of research mainly because of the dangerous ethical implications that come with these AI structures such as privacy violation, discrimination, and security threats (Stark, 2023). It states that for the correct policy evaluation when utilizing AI models and simulations, it is crucial to include morally pertinent dimensions of culture, which points out the significance of social contextual factors (Diallo et al., 2020). However, the usage of AI in marketing initiated ethical concerns, and hence it calls for collaboration on various stakeholders to balance between provided ethical standards and ensure the welfare of the society (Gill, 2020). Problems for the normative basis of AI social choice ethics arise from lack of the single aggregate ethical vision of the society, stressing the essential non-triviality of the decision making in AI design as well as the ethical issues related to it (Baum, 2017). Being aware of these ethical and social elements is important in the first place for having a proper approach to AI.

The selected research focuses on AI's effect on privacy, where the authors discussed the existing problems and potential improvements. AI is quickly integrated into many fields such as healthcare and social platforms, which pose high privacy risks since it has the capability of predicting and inferring personal data from large datasets (Colonna, 2021; Watney, 2024). This is because current privacy laws are insufficient to meet the dynamics of AI-based data collection and/or utilization (Carmody et al., 2021; Watney, 2024). At the same time, there is an understanding of AI's positive capabilities for improving privacy, such as means like data protection by design, which is the implementation of privacy measures into the creation of AI technologies (Colonna, 2021). Further, AI and privacy are not only about technological or program-based approaches but about who has control over AI and how new AI systems fit in with the value system of a society (Dignum, 2022; Sheikh, 2021). There is also a demand for solid legal solutions encompassing AI, as well as unanimous protection of people's rights to privacy. This involves updating the current laws and possibly enacting new laws that are formulated to deal with AI's peculiar conditions (Shimpo, 2020; Watney, 2024). In conclusion, despite the threat that AI presents to personal privacy, efforts are being made in addressing how to manage privacy by virtue of the powers that come with AI and how to align development with ethically acceptable standards and/or the culture of the society (Colonna, 2021; Dignum, 2022).

Thus, the detailed look into the different findings and the ongoing and newly emerging aspects of the research topic defined as AI's ethical and social concerns reveals several important concerns and potential ways to address them. It has stressed the ethical and social consequence of the integration and adaptability of AI in the different sectors, privacy invasion, prejudice, discrimination, joblessness, and change in the current structure social order which raises ethical issues (Ayub & Banday, 2023). These problems urge the creation of AI moral responsibility and the promotion of ethical norms of the personal, others', and social responsibilities (Shen, 2023). Investigations show that increased regulatory compliance directly compares to the enhanced effectiveness of AI and governance of the information (Alam, 2024). Further, AI ethics awareness as well as the professional training in the use of AI are inversely linked with social changes (Oladoyinbo et al., 2024). Nonetheless, this growth is not without its drawbacks. Questions arise regarding the ethical considerations of when AI systems and robots should be deactivated, bringing up complex issues related to the concepts of termination rights and the ethical implications of decommissioning artificial entities. Three factors of ethical risks in AI decision making have been established as the primary causes; technological risks, data gaps, and

managerial mistakes. Such risks are crucial measures that need to be managed through appropriate risk management strategies in order to avoid compromising ethical principles concerning the use of AI (Guan et al., 2022). In addition, it is necessary to address such questions as how AI and parallel intelligence shall be introduced to digital and smart organizations and how important human ethical principles, such as the equality and freedom of people, and ecological responsibility shall be preserved from negative consequences, turning instead into the amplifiers of inequity or violating people's rights to privacy (Wang et al., 2024). All in all, ethical and social aspects of AI extend to virtually all the topics of concern and present a wide range of challenges that demand elaborate approaches and guidelines in order to be solved. Such are improvement of compliance with regulations, creating ethical consciousness, and proper usage of AI technologies in the organization reporting (Matyashova, 2022).

LITERATURE REVIEW

Contemporary research in the area of AI ethics and social factors discusses the relevance and multifaceted nature of ethical issues as AI systems continue to gain prominence and permeate different aspects of people's lives (Benefo et al., 2022). An interesting and exciting research direction is the determination of ethical threats in AI decisions comprising technology vagueness, imprecise data, and managerial mistakes with algorithmic discrimination and data prejudice outcomes (Guan et al., 2022). In order to manage the above risks, a theoretical risk-factor model has been built with the help of rooting theory, which discusses how risks interact with one another and also offers the strategies of risk management (Guan et al., 2022). Moreover, more explicit regulatory compliance was found to be positively related to AI application's perceived efficacy in the context of its usage, as well as AI ethic mindfulness and data purity guarantee (Oladoyinbo et al., 2024). This implies that proficiency in AI can change social relations for the better with AI specialists and experts identified as being in dire need of ethical sensitivity training and education (Oladoyinbo et al., 2024).

Besides, with the developing AI application in digital and smart organizations especially in the metaverse area, the human ethic, society responsibility and ecological duty of the organizations should be paid consideration to avoid worsening the social injustice or violating the privacy rights of individuals (Wang et al., 2024). Thus, it can be seen that this holistic view of AI deployment underlines the need for ethical approaches which, while being technically robust, are also socially just. Furthermore, the architectonics of the ethic of responsibility for AI should encompass personal, other's and social as we strive to overcome inefficiencies in the paradigm space of ethical dilemmas, namely privacy leaks, algorithmic black boxes, and the superinduced alienation of human relations (Shen, 2023). The dilemma of AI ethics is thus systematic in nature, which entails an effort to regulate and normalize the ethical issues that are inherent in the application of AI from its conception to implementation (Shen, 2023). These developments underpin a newer awareness of the comprehensive approach, which suggests that philosophy, ethics, and AI development must be integrated to prevent both current and future ethical mishaps in artificial intelligence systems (Balmer, 2023; Wang et al., 2024).

Concerning the challenges of the approach presented in this paper, the risk of omitting relevant features and domains appears to be the most significant. Open questions: With regard to the open questions that originate from this article, it is possible to identify numerous further developments and questions. AI is an area with indefinite ethical, social and technological issues that need to be addressed and prevented before they happen. Some of this is to do with ethics, for instance, how to avoid bias and discrimination, where privacy and AI accountability and transparency are key concerns (Ayub & Bandy, 2023; Shen, 2023).

Creation of detailed legal and ethical frameworks that will address the use of AI can lead to improvement in the quality of data used and; fairness in the use of AI since research shows that strict adherence to legal frameworks improves the efficiency of AI (Oladoyinbo et al., 2024). Ethical AI Education: Proposing institutionalization of professional development, specifically training in AI ethics to ensure people embrace moral responsibilities and improve on the social arrangements of AI (Oladoyinbo et al., 2024).

New technologies for developing AI systems that would help in solving ethical issues, for instance, algorithm traceability and responsibility as the foundation of trust and stability in modern advanced AI systems (Ayub & Bandy, 2023). Promoting cooperation with other countries for the creation of common ethical guidelines and measures related to the use of AI that protect from such threats as social manipulation,

the exacerbation of geopolitical tensions (Matyashova, 2022). Addressing the issues of ethical applications of AI in its creation as well as its use from what can benefit society and promote sustainability within the environment (Wang et al., 2024).

AI offers different ethical and social aspects that are considered important in the occurrence of various tones in academic works (Erman & Furendal, 2022). In a similar way, examining the impact of AI agents on people's behavior, researchers distinguish between the intervention types based on various models such as models of roles, including role models, advisors, partners, and delegates due to the perceived unethical behavior supported by AI (Köbis et al., 2021). Big data and other AI technologies' ethical issues focus on empirical case studies due to the complexity in solving ethical issues across multiple domains and applications (Fossa & Sucameli, 2022). Due to the integration of AI in people's lives, there are concerns involving issues such as privacy, discrimination, and insecurity, all of which are factors that can be discussed in AI ethics (Rajaonah & Zio, 2022). Besides, research focuses on the positives and negatives of AI technology as ethical autonomous agents; the major ethical issues found are privacy, bias, trust, transparency and the relationship between human and AI (Kamila & Jasrotia, 2023). Altogether, these works reveal the need for developing the ethical culture in AI and for raising the awareness of all the stakeholders about the correct, transparent and accountable AI systems.

Still, the aim of managing the ethical and social side of AI and enabling fair decision-making, public trust, and perceptions of fair play when it comes to AI decision-making should be considered (Robles & Mallinson, 2023; Narayanan et al., 2023). The EU Commission's proposed regulation stresses the need for transparency in the AI higher-risk applications particularly in the medical diagnostic context and post hoc explain ability as well as Uncertainty Estimates to enable safety and reliability (Onitiu, 2022). Moreover, the lack of correlation between the AI technology and legislation indicates the need for substantial legislation such as the Europe's Artificial Intelligence Act (AIA) to regulate AI technology and protect democracy and human rights (Memarian & Doleck, 2023). The combination and implementation of CAITE also hold an insurance policy and a nuanced standard to regulate ethical practices of AI models and the training datasets, the soft law approaches that enable ethical use and access (Cao & Yousefzadeh, 2023). By harmonizing these insights and frameworks, it is possible for policymakers to begin the challenging journey of developing a correct legal environment that can support the growth of parity, clear approaches and solid ethical standards within the application of AI (Santhoshkumar et al., 2023).

To understand ethical and social aspects of AI, there is the use of particular methods for the investigation. The cross-sectional survey employs questionnaires to get primary data from AI practitioners to establish a relationship between the level of relaxation of regulations and ethical consciousness and the efficiency of AI adoption (Oladoyinbo et al., 2024). Similarly, qualitative research techniques are also employed to actuate ethical risk factors and develop models analyzing the relationships between these risks (Guan et al., 2022). Moreover, general studies are performed to contribute to the formation of the principles for the moral use of AI technology (Alam, 2024). They assist in gaining insights about the ethical and social aspects of intelligent MIS and about the ways of managing such issues.

Ethical and social dynamics of AI have proliferated to an ever-growing range of research topics over the last few years, resulting in an extremely multifaceted and multidisciplinary research field. The literature has moved out of the conceptual debate on AI threats into more empirically based literature on governance structures, algorithmic responsibility, transparency infrastructures, and responsible innovation. This trend can be observed in your bibliometric results, which demonstrate a significant increase in the intensity of research publications since 2018 and more so since 2020, in parallel with the implementation of AI systems in the populations of the world in government offices, the medical sector, and digital environments.

The article by Qian et al. (2024) is one of the most significant contributions in this changing sphere as it presents a systemic analysis of the ethical, legal, and governance challenges of AI. They focus on three interrelated areas which include

- (1) normative-legal goals,
- (2) algorithmic bias and discrimination, and
- (3) governance mechanisms and propose that smart governance demands the inter-orchestration of institutional, human-centered, and technical approaches.

This is very much consistent with your co-occurrence analysis of keywords where governance, transparency and fairness seem to be the key actors between computer science clusters, policy studies clusters, and digital sociology clusters. Their work can also be seen as an expression of the change which you noticed in the previous philosophical discussions towards a more operational one after 2020.

To add to this viewpoint revolving around the governance theme, Ghosh (2025) organizes a comprehensive bibliometric/thematic assessment of close to twenty years of AI ethics literature. Their findings are relatively similar to your mapping: fairness, bias, accountability, privacy, and human agency are the most structurally significant ones; whereas such themes as participatory AI design, environmental sustainability, and equity in global governance are also growing but remain fewer central clusters. The idea of the fragmentation of the field, whereby a rapid thematic growth is not accompanied by conceptual integration, as noted by Ghosh (2025), is directly analogous to the density analysis of your clusters, in which higher density is evident after 2022, and there is an explosion of small, emergent research niches.

Beheshti and Kerridge (2025) provide a more philosophical orientation, by suggesting a subtle model of human and AI, with analytical, applied and generative forms. They claim that both of these forms present different ethical and governance issues, which need to be subject to different regulation approaches. This assertion is supported by your temporal trend analysis: before 2022, the topic of AI ethics focused more on analytical and applied systems (e.g., predictive models in health or finance), whereas after 2023 generative AI will be one of the most growing themes, with misinformation and creative autonomy, authorship, and human-AI agency relations being issues.

METHOD

Data Collection

To study a specific set of materials, articles to be included were reviewed based on strictly defined standards that would guarantee credibility of the findings. The emphasis was on the papers targeting the moral and social aspects of AI, including new methods or improvements and innovations in this sphere. Subsequently, the inclusion criteria included an analysis of the titles and abstracts before the use of keywords, which reduced bias in accordance with the research subject. A high-quality index whose broad example is Scopus, was chosen as the primary source of journal articles, given its vast coverage of the industry, especially in aspects of ethics and the social sciences. Due to the specificity of the chosen topic, the following keywords and Boolean operators were used: AI ethics; social impact of AI; ethics of AI; and other AI-related terms obtained with the help of controlled vocabulary. This approach was helpful because it tried to obtain highly relevant and important articles. The choice of the Scopus database was made due to the fact that it encompasses scholarly journals, conference proceedings, and other publications; using such a database increases the reliability of the obtained dataset. Consequently, scientific article selection was carried out through the use of stringent criteria of inclusion and exclusion, as well as a well-coordinated search strategy, which are critical in the conduct of bibliometric analysis for this research.

Inclusion and Exclusion Criteria

As a result of that, some amount of rigorous effort and thinking was put into the creation of a strong framework that would facilitate the integration of scholarly methods in the dataset. The criteria of inclusion were limited to the research articles, and this was in line with professional conduct and considering the fact that the different research articles that were conducted had gone through different procedures in the evaluation process to come up with the final result. This approach is intended to capture only those articles that have gone through a selection process that is very rigorous and comprehensive hence ensure that only research articles of the best quality are captured. On the other hand, the exclusion criteria are focused on this academic paper by excluding non-peer reviewed articles. If the paper was not peer reviewed following subsequent stages, like a conference abstract or a gray literature document, the authors deliberately avoided it in the bibliometric analysis to maintain the high scholarly rigor necessary for the evaluation strength. When applying the aforementioned inclusion and exclusion criteria, it is possible to state that only articles that passed through thorough assessment procedures conforming to the studied scholarly JIF corresponded to the criteria list. Thus, the final dataset is considered to demonstrate adequate overall reliability and critical

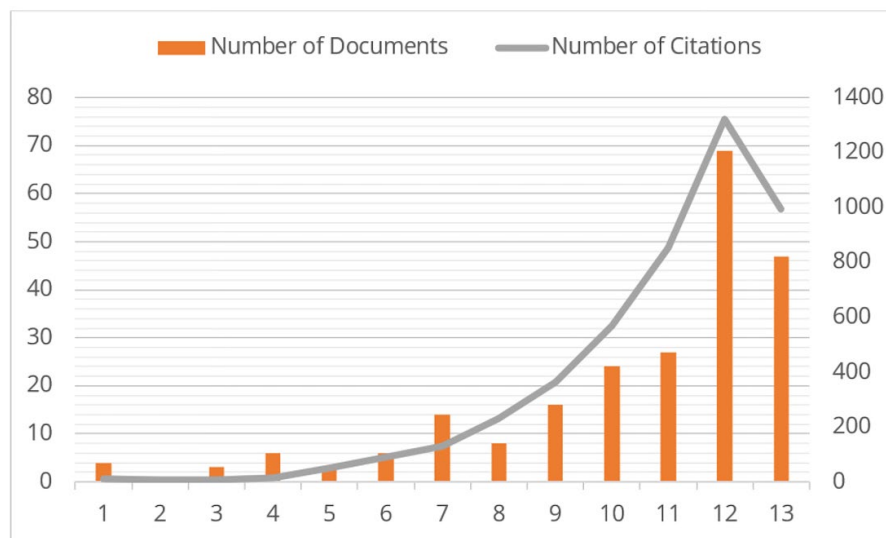


Figure 1. Number of publications and citations between 2012-2024 (Source: Authors' analysis based on Scopus database)

quality criteria that would contribute to the improved reliability of the subsequent bibliometric review of the ethical and social dynamics of AI.

Data Analysis Techniques

This section encompasses two crucial subtopics: cooperating with bibliometric indicators as well as the application of statistics. Bibliometric indicators include basically metrics based on which several aspects of the specific area of study and achievements can be revealed within the sphere of AI ethics and social impact. The purpose of this kind of study is to look at the different aspects of scientometry, so as offer an impartial observation on how the scientific society complements the picture by sitting in relation to these ethical and social concerns. One crucial component to mention is that statistical approaches are core to the concept of data analysis, which implies the usage of statistically generated models on a given dataset to obtain important information from it. The descriptive statistics and inferential statistics together with correlational analysis are used to look for patterns in the data. This method, which forms a line of argument, constructs a rational paradigm that equips the evaluators with information that is paramount in shaping ethical social questions about AI. In the same manner, it also promotes a much clearer structure of the assessment of the strength and weakness of a field. Together with bibliometric indicators for the scientific performance of the authors of publications, the statistical methods are an inseparable part of the analysis and form a highly effective tool to study the ethical and social aspects of AI.

RESULTS

Annual Trends in Publication Volume and Citation Impact

This initial assessment by combining the data of [Figure 1](#) shows a great increase in the two values and the scholarly impact in the years from 2012 to 2024, which reflects the growth of the field. To start with, it is observed that the field was rather dormant with four documents having been published in 2012 and attracting only twelve citations. The subsequent years reflected a relatively low growth with some annual citations' variation. For example, in 2013, there were one and in 2014, there were three documents having minimal citation impact values: six and nine, respectively. A great expansion was observed beginning from 2016 in which although the number of documents was only 3 but the citation count zoomed to 49, indicating the beginning of the research of significance. This was experienced in the year 2017 and 2018 showing an increase in the both the number of documents and citation. But by the end of 2018, the documents available were 14 and citations were 129 which show the enhanced concern with this field. Although, the production activities created a significant shift from the years 2019 to 2020 with an increased number of publications and citations. Of the documents published in 2019, 8 were cited 230 times; in 2020, 16 documents were cited 365 times.

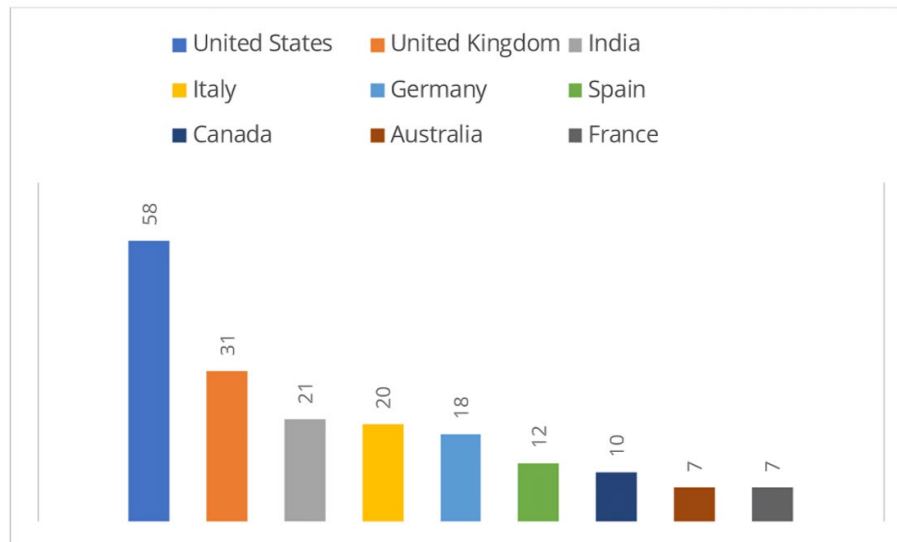


Figure 2. Most publication countries (Source: Authors' analysis based on Scopus database)

Upward trend commenced and proliferated especially in 2021 and 2022 with 24 and 27 documents, respectively garnering 569 and 853 citations showing a fast-rising trend of the research activity and impact.

The apex of this trend is reflected in documents published in the year 2023 where the count went up to 69 with the citations standing at 1321. Although it was discovered that the number of documents reduces slightly to 47 in 2024, the citation impact stands at 995. The following data demonstrates the solid and continuous trend of ethical and social issues related to AI, proving the growing impacts of this field and the awareness of its significance in academic as well as professional spheres. The sharp increase in publication and citation in the later year advocate for the dynamism of the area.

Top Contributing Nations Driving Research and Innovation

In introduction to AI, some of the countries occupying a leading position in terms of the latest publications and numerous inventions are revealed by the latest bibliometric data. The USA takes the lion's share with 58 publications that confirms the country's leading role in defining the parameters of ethical and social interaction within the AI framework. Secondly, the UK also portrays strong contributions with 31 publications identified in the selected databases. Globally, India appears as an upcoming power with 21 publications which underlines the fact that India is a rising power in the field of AI research. Italy has submitted 20 publications and Germany 18; this shows that both countries have strong conditions that support academics in the development of AI. Out of all those countries, the most publications are from Spain (12), Canada (10), Australia (7), and France (7) to denote that they are actively participating in the discourse on the ethical and social issues of AI worldwide (Figure 2). Combined, these nations represent a synergy in the experimentation of leaving no stone unturned on the state of AI and its relations to ethics and society.

Leading Contributors and Pioneering Authors in the Field

In the vast literature of AI with respect to ethical and social aspects, there are several authors that have received major attention. The first is the ISI, where Luciano Floridi and Mariarosaria Taddeo distinguish themselves as leaders of the group with four publications each, therefore demonstrating the depth of the performed impact and scientific relevance to the subject. In the matter of AI ethics, David Schiff is not far behind with 3 publications. Notably, a diverse group of authors such as Nicola Akiya, Sameer Ali, Eduard Awad, Amanda Blanchard, Cynthia Breazeal, Kirsten Brukamp, and Vasiliki Charisi each presented two articles signifying their group's commitment to understanding the ethical issues involved in AI construction and utilization. Altogether, they are a strong team of authors who advance the study process, paying attention to the social effects and ethical issues connected with AI (Figure 3). Scholars contribute immensely to the development of a knowledge base through their research while at the same time contributing to formulation of policy and practice that would preserve AI development as a responsible and ethical development.

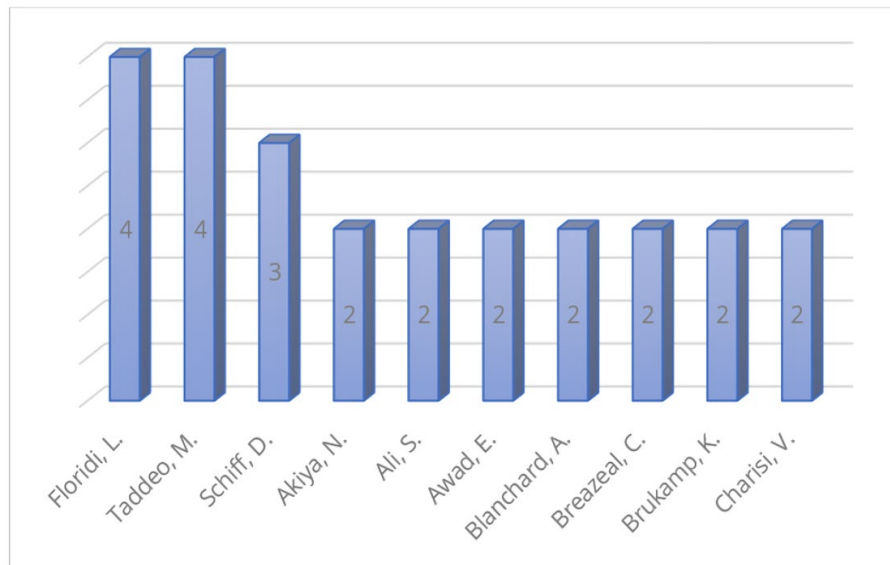


Figure 3. Topmost productive author names (Source: Authors' analysis based on Scopus database)

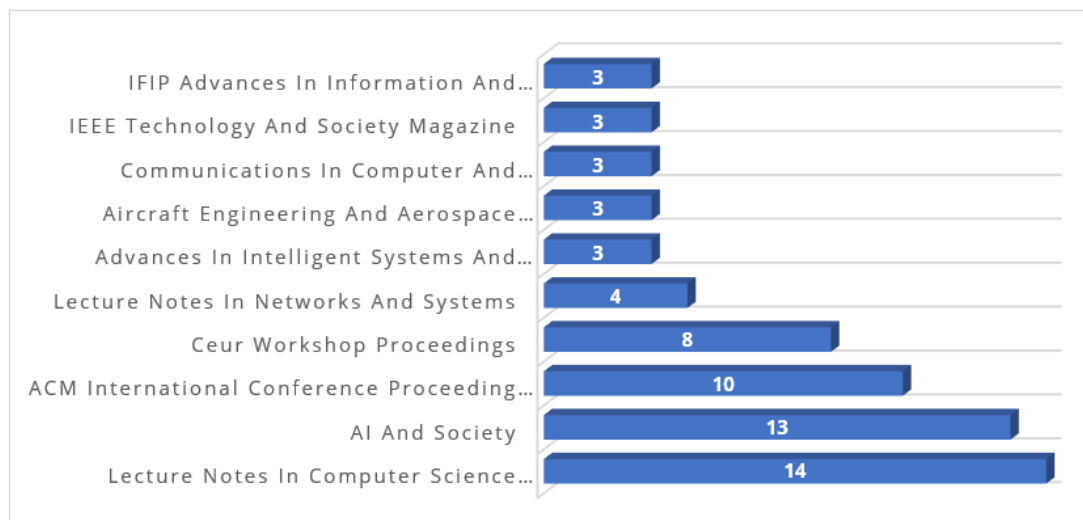


Figure 4. Number of publications over leading journals and sources (Source: Authors' analysis based on Scopus database)

Leading Journals and Key Publication Sources in the Field

Analyzing the existing field of AI and its ethical and social implications, it is necessary to determine key sources for publishing academic articles. At the head of the ranking stands the Lecture Notes in Computer Science with its branch that concerns AI and Bioinformatics which includes 14 documents, which underlines the resource's significance in the field. Next is the journal of AI and Society with 13 documents featuring a debate and analysis of the issues affecting society due to AI solutions. Next is the ACM International Conference Proceeding Series with 10 documents, which serves as the forum presenting the most recent innovations in the field of AI.

Further, Ceur Workshop Proceedings has the eighth rank with eight documents, thereby stressing its importance in encouraging communication and cooperation among the AI society. These also include Lecture Notes in Networks and Systems, Advances in Intelligent Systems and Computing, Aircraft Engineering and Aerospace Technology, Communications in Computer and Information Science, IEEE Technology and Society Magazine, and IFIP Advances in Information and Communication Technology with 3 documents each so they all aid in the enhancement of the multifaceted scholarly materials on AI's ethical and social ramifications across various areas and outlooks (Figure 4).

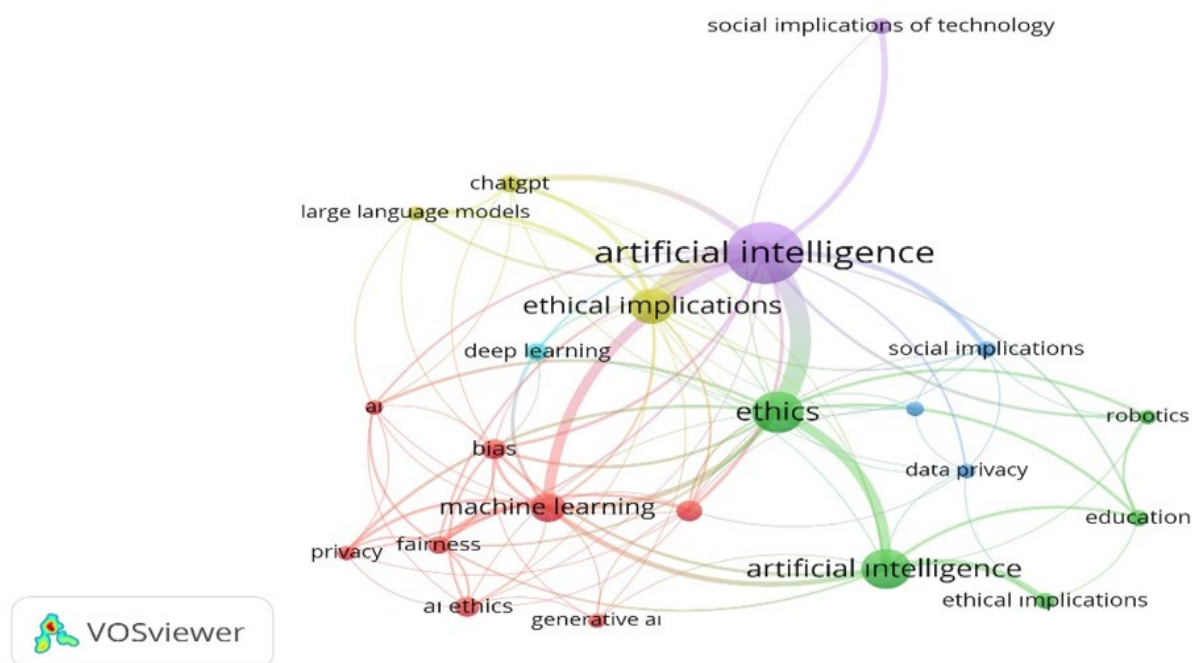


Figure 5. Co-occurrence of keywords (Source: Authors' network analysis using VOSviewer software based on Scopus database)

Author Keyword Co-Occurrence Analysis

Author keyword co-occurrence proved as a valuable tool in revealing the thematic structure and the character of the relationships between the materials existing in the field regarding ethical and social issues of AI. **Figure 5** shows the keyword-bivalued graph of this particular field and shows where it occurs what are the prodigious that bearing how they are concatenated. The node labeled as 'artificial intelligence' is at the center of the developed graph, whereas more significant concepts like 'ethical implications', 'ethics', 'machine learning', and 'social implications' are connected to as being directly associated with the primary node of the graph as well. Among the keywords, some of the most elevated Cohen's kappa coefficients are machine learning (ML), bias, fairness, and privacy—some of the signs indicated that emphasis on ethical issues of AI technology. Based on the analysis of the appearance of the two terms, it is possible to infer that bias and fairness in ML fall among the most discussed issues in the area of AI ethics. Therefore, connection of 'data privacy' to 'ethics' and 'social implications' shows the importance of guarding personal data in the sphere of AI. It also shows the detailed sub-topics that are successively emerging or brand-new topics in the field under consideration. Just like syntax links 'ChatGPT' to 'AI' and 'ethical effects' are connected in the same way that 'large language models' is related to 'AI' as well as 'generative AI' is related to 'ethics' which are some of the new subjects that have lately emerged as studies on these improved AI technologies (**Figure 5**). This can be seen as implying that as the enormity of the diffuse models of AI application increases, questions concerning the ethical use of such applications are gradually being raised by scholars.

DISCUSSION

This review discusses the development and the global trends of the literature on AI ethics, the main contributors, and productive countries (Chuang et al., 2022). It also pays attention to the issue of AI and blockchain for interaction in smart cities, where the increase in interaction types is complex, to highlight new tendencies and research focuses (Alaeddini et al., 2023). In addition, the questions concerning the ethical approaches to AI are also directed to the use of social robots, as well as to the development of the virtuous systems of AI Robotics based on the virtue ethnicity (Constantinescu & Crisp, 2022). Furthermore, the need for a measure of AI ethics is highlighted, which was developed to assess people's perceptions and concerns on AI research ethics based on the CAE report, especially among the Japanese and American participants

(Hartwig et al., 2022). Thus, the article under analysis offers the synthesis of insights that are important for academia and practitioners in AI; It points to ethical and social aspects related to the application of AI.

Based on the analysis of the scholarly articles produced from 2012 to 2024 related to AI ethics, it can be stated that the field, as well as the problems connected with social dynamics, is rapidly developing. This increased growth signifies the increasing awareness and significance of the subject area in academic and professional practice. The decade of the field can further be subdivided into years and based on this, it is clear that during the first year, that is, in 2012 the field was relatively quiet with only four documents which called for twelve citations. The presented low level of activity also indicates that ethical and social aspects of AI were not integral to scholarly discussions at that time. In the subsequent years, 2013 and 2014 a fewer numbers of documents were published as well as the citation count; one and three documents as well as six and nine citations. This period can be described as the initial stage of people's concern with this subject, which is not very actively discussed in academia to this date (Floridi, 2014). A large change happened in the year 2016, during which only three documents were put out, yet the citation count jumped to 49. This trend continued up to 2017 and 2018; with a greater number of documents and citations. By the end of the year 2018, 14 documents collected 129 citations, and, thus, there was more attention in the field (Mittelstadt et al., 2016). The two years were analyzed as the years of fast-growing, where 8 documents published in 2019 were cited 230 times, while 16 documents in 2020 were cited 365 times. This period probably corresponds to the growing public and academic interest in AI's pro-ethical and societal consequences, as evidenced by a rising number of publications on AI ethics (Whittlestone et al., 2019). This upward trend persisted in the years 2021 and 2022 with 24 and 27 documents published to be exact and receiving 569 and 853 citations.

Such significant growth in the number of publications and the corresponding citation in recent years reflects urgent concern with a rapidly developing area that expands both in terms of academic focus and impact (Jobin et al., 2019). The highest level of this trend was registered in the year 2023 with a fair increase to 69 documents and 1321 citations proving the scholarly activity and effectiveness in this respective field. However, in 2024, although the number of documents became slightly less and equal to 47, the citation impact reached the level of 995. This indicates that there remains a strong interest and influence of the research with a decreased, albeit fundamental, number of new publications. Utilizing the geographical mapping of the publications, it is possible to determine that some countries are more active in the research of AI ethics. The USA takes the lead with 58 publications demonstrating its leadership in defining the standards of AI's ethical use. The UK appears next with thirty-one works suggesting the level of its commitment to the subject. Other relevant contributors are India with 21 articles of publication demonstrating the new appearance of this country as the participant of the AI research; Italy and Germany with 20 and 18 articles, respectively, which emphasize a favorable academic background in AI ethics (Cath et al., 2018). Other equivalent participants in the global discourse include Spain with 12, Canada with 10, Australia with 7, and France 7. Thus, the present global partnership underlines the topicality of ethical and social aspects of AI (Boden, 2018). Some of the scholars that have been at the forefront in the scholarship of it include Luciano Floridi with four key articles and Mariarosaria Taddeo with an equal number of articles. Close behind him is David Schiff with three publications. They are Nicola Akiya, Sameer Ali, Eduard Awad, Amanda Blanchard, Cynthia Breazeal, Kirsten Brukamp, and Vasiliki Charisi; each of them has published, at least, two sources on AI's ethical and social implications (Awad et al., 2020; Floridi, 2019).

The literature of the field is published through a contingency of academic journals, and conference proceedings. Among the sources, Lecture Notes in Computer Science dominates the list of sources with 14 documents, and it is closely followed by the journal *AI and Society* that sums up 13 documents. Other outlets of substantial importance include the ACM International Conference Proceedings Series and *Cleu Workshop Proceedings* with 10 and 8 documents, respectively. Some of the other prominent sources are *Lecture Notes in Networks & Systems*, *Advances in Intelligent Systems & Computing*, *IEEE Technology & Society Magazine* and the like. Co-occurrences of keywords show the field's theme organization with 'artificial intelligence' in the paradigm placed around the notions of 'ethical implications', 'machine learning', and 'social.' The most frequently used words are most relevant to today's AI ethics discussion and include ML, fairness, and privacy. Topics that are relatively recent, like "ChatGPT", "large language models" and "generative AI", are increasingly related to ethical debates showing how fast the area of AI is expanding as new technologies are continuously being created.

The fact that recent research is synthesized indicates that significant implications are to be observed when the bibliometric patterns revealed in this study are interpreted. The findings indicate that there is a fast growing, but a very fragmented research environment, and the literature gives a clue to the reasons why this fragmentation is taking place and how it can be organized.

First, the networks of co-occurrence seem to be dominated more and more by governance-related themes, which resonates with the conclusions of Qian et al. (2024). The fact that after 2020, the scholarly community began to focus on clusters centered on AI governance, algorithmic accountability, and regulatory frameworks indicates that the scholarly community is shifting to more procedural and institutional methods of responsible AI. Nevertheless, the low degree of cross-linking of governance clusters and technical clusters in your network analysis shows that there is a disconnect between the conceptual governance suggestions and the technical adoption of governance implementation in support of the argument by Qian et al. (2024) that governance needs to be addressed through a combination of institutional and technical approaches rather than in silos.

Second, the thematic proliferation described by Ghosh (2025) can be seen in the scores of modularity increasing and the quantity of separate clusters of your data growing over time. Although such diversification is a pointer of intellectual dynamism, it also indicates conceptual fragmentation. To illustrate, in your analysis, it can be seen that the theme of human-AI collaboration, AI to social good and environmental issues of AI are represented in the form of small yet rapidly growing clusters that do not have strong links to mainstream themes. This confirms what Ghosh (2025) points out claiming that the new ethical issues are still not given corresponding academic or policy coverage. The findings of yours thus point to the areas of blindness where the interdisciplinary synthesis of the future is needed.

Third, the fact that generative AI is rapidly growing, and it is one of the most pronounced time patterns in your data, is consistent with the theoretical knowledge of Beheshti and Kerridge (2025). Their three-fold differentiation of analytical, applied and generative intelligence is helpful in understanding why clusters of creativity, agency, misinformation, and autonomy explode beyond 2023. These themes are conceptually different to the previous issues like bias or transparency, which implies the profession is entering a new stage of existence when the commonly accepted ethical frameworks are not enough. Bibliometrics findings support this change: the concepts related to generative AI have their own semi-independent set of results, which shows that scholars are creating new discourses of new risks, and not merely amplifying the existing ones.

Also, findings on geographic and institutional collaboration indicate constant asymmetry in the world in participation in research. Institutional hegemony of the USA, the UK, and Western Europe is opposed to the rather peripheral role of the Global South researchers. There are governance implications of this imbalance: in case the ethical AI discourse is regionally concentrated, policy frameworks might not be able to represent global sociocultural diversity. This concern is appropriate to literature, such as Qian et al. (2024) and Ghosh (2025) both emphasize the necessity of more comprehensive AI governance ecosystems. This paper therefore supports the argument of increasing geographically dispersed research networks and the globally sensitive models of governance.

Lastly, the synthesis of knowledge between the literature suggests that there is another systemic problem, an increasing disconnect between the rate of AI advancement and the evolution of regulation, discursive frameworks, and ethical standards. Although according to bibliometric analysis, the number of studies related to ethical AI grows exponentially, the cluster concerning governance does not expand by the same percentage as compared to the technical ones, or those that deal with generative AI. This implies that there is no commensurate governance response towards change in technology, something that has been echoed in the literature. Representing this as the structural misalignment shows the sense of urgency towards anticipatory governance, multidisciplinary cooperation, and proactive regulation creating.

CONCLUSION

The bibliometric evaluation of the ethical and social aspects of AI for the period 2012-2024 revealed that the field has gained much attention in research scholarship. These impacts exemplify the ever-rising interest in the subject, its key authors, and countries, as well as the insistence on ethical and social issues in AI

advancement. Seeing that the respective technologies are still evolving, AI is most likely to stay alive as well as remain a vital branch of research as well as a practical concern.

The analysis of keyword co-occurrence also shows the development of the field over the years, highlighting the new topics. They are currently dominating discussions, including bias, fairness, privacy, and the ethical issues of AI deeply integrated into people's lives and industries such as ChatGPT and large language models. These themes suggest there is increased awareness of AI as being composed of multiple and nuanced ethical considerations. Thus, it can be stated that as AI technologies develop further, new ethical concerns and challenges will appear and, therefore, there is a need for sustained ethically related empirical studies and the development of new guidelines. Technological advancement must be recognized by the field to guarantee that ethical analysis also progresses with the given technology. This means that there is a need for daily multi-disciplinary contribution and the involvement of technologists, ethicists, policy makers and the public.

Therefore, knowing the scientific factors at the field level has useful future implications for policy and practice. Due to the continuous expansion of the deployment of AI technologies in different spheres of people's lives, it is important to establish sound ethical standards and public policies for AI usage. The research in AI ethics provides beneficial findings and suggestions that act as evidence for the formation of policies and formation of AI in sync with social values and moral frameworks. Furthermore, it is evident that the subject area's expansion contributes to expanding education and creating awareness. It is time to address the ethical aspect at the stage of AI education and start a public discussion about the social impacts of AI as the key to creating a society ready for the opportunities and challenges of AI technologies.

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