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Review

Research Trends in Artificial Intelligence and Security—Bibliometric Analysis

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Abstract: This paper provides a bibliometric analysis of current research trends in the field of artificial intelligence (AI), focusing on key topics such as deep learning, machine learning, and security in AI. Through the lens of bibliometric analysis, we explore publications published from 2020 to 2024, using primary data from the Clarivate Analytics Web of Science Core Collection. The analysis includes the distribution of studies by year, the number of studies and citation rankings in journals, and the identification of leading countries, institutions, and authors in the field of AI research. Additionally, we investigate the distribution of studies by Web of Science categories, authors, affiliations, publication years, countries/regions, publishers, research areas, and citations per year. Key findings indicate a continued growth of interest in topics such as deep learning, machine learning, and security in AI over the past few years. We also identify leading countries and institutions active in researching this area. Awareness of data security is essential for the responsible application of AI technologies. Robust security frameworks are important to mitigate risks associated with AI integration into critical infrastructure such as healthcare and finance. Ensuring the integrity and confidentiality of data managed by AI systems is not only a technical challenge but also a societal necessity, demanding interdisciplinary collaboration and policy development. This analysis provides a deeper understanding of the current state of research in the field of AI and identifies key areas for further research and innovation. Furthermore, these findings may be valuable to practitioners and decision-makers seeking to understand current trends and innovations in AI to enhance their business processes and practices.

Keywords: artificial intelligence; deep learning; machine learning; security; blockchain

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1. Introduction

Artificial intelligence (AI) has become an integral part of the modern technological landscape, defining new horizons and providing extraordinary capabilities across various domains of life [1,2]. This fascinating subdomain of computer science continues to evolve [3], particularly thanks to innovations in areas such as deep learning, machine learning [4], AI security, and the application of blockchain technology [5]. Each of these segments plays a crucial role in the broader AI ecosystem, bringing new depth and diversity to our ability to create and understand intelligent systems.

Deep learning represents one of the most exciting aspects of AI, enabling computers to autonomously learn complex patterns from vast amounts of data. Inspired by the organization of the human brain [6], this technology has revolutionized how computers perceive the world around them, contributing to advancements in fields such as image recognition, natural language processing, and data analytics [7]. Machine learning, on the other hand, explores algorithms and techniques [8] that allow computers to learn from experience without explicit programming. This field is essential for developing predictive models, recommendations, and optimizations in various domains.

AI security is becoming an increasingly critical topic [9], especially with the growing number of connected devices and systems. With the proliferation of the Internet of Things (IoT) and the digitization of various industries [10], the need to preserve the security and privacy of data becomes inevitable. In this context, the development of security-aware AI becomes imperative [11], focusing on creating algorithms and systems resilient to various types of attacks and misuse while maintaining high levels of performance and efficiency. Security concerns are especially pertinent as AI systems increasingly handle sensitive data, raising questions about data protection and ethical use. The awareness of data security is essential, and it must be heightened to ensure the responsible application of AI technologies.

The importance of AI security is further underscored by recent incidents where AI systems have been exploited, leading to significant data breaches and misuse of information. As AI continues to be integrated into critical infrastructure, from healthcare to finance, the potential risks associated with inadequate security measures become more pronounced. Researchers and practitioners must, therefore, prioritize developing robust security frameworks that can anticipate and mitigate these threats. Ensuring the integrity and confidentiality of data managed by AI systems is not only a technical challenge but also a societal necessity, demanding interdisciplinary collaboration and policy development.

Blockchain technology, with its fundamental characteristics of decentralization and security, is gaining importance in the context of AI [12]. This technology provides transparency and data integrity, eliminating the need for centralized intermediaries and ensuring secure transactions and data storage. In combination with AI, blockchain opens up new possibilities for applications in various fields [13].

In line with the ubiquity of AI and its increasing impact on various spheres of society, research in this area is becoming increasingly important and comprehensive. This paper aims to analyze key trends in AI research, focusing on topics such as deep learning, machine learning, AI security, and blockchain technology. Through bibliometric analysis of publications in the Web of Science database over the past few years, we will explore the distribution of studies by year, the number of studies, and citation rankings in journals, as well as the leading countries, institutions, and authors in the field of AI. We will also analyze the distribution of studies across publication domains and the frequency of the occurrence of key author keywords to gain a deeper understanding of the thematic structure of research in this field.

It is expected that the results of this analysis will provide deeper insights into the current state and dynamics of AI research, identify key areas for further research and innovation, and inform the academic community, industry, and policymakers about current trends and potential research directions in the future.

2. Research Methodology

In this section, the methodology of reviewing papers on artificial intelligence in tertiary education is presented. This research study used the WoS database (Clarivate Analytics Web of Science Core Collection: Science Citation Index, Social Sciences Citation Index, Arts & Humanities Citation Index, Conference Proceedings Citation Index, Book Citation Index, Emerging Sources Citation Index, Index Chemicus, Current Chemical Reactions, Preprint Citation Index) [14] and a review was conducted following the PRISMA framework shown in Figure 1 [15].

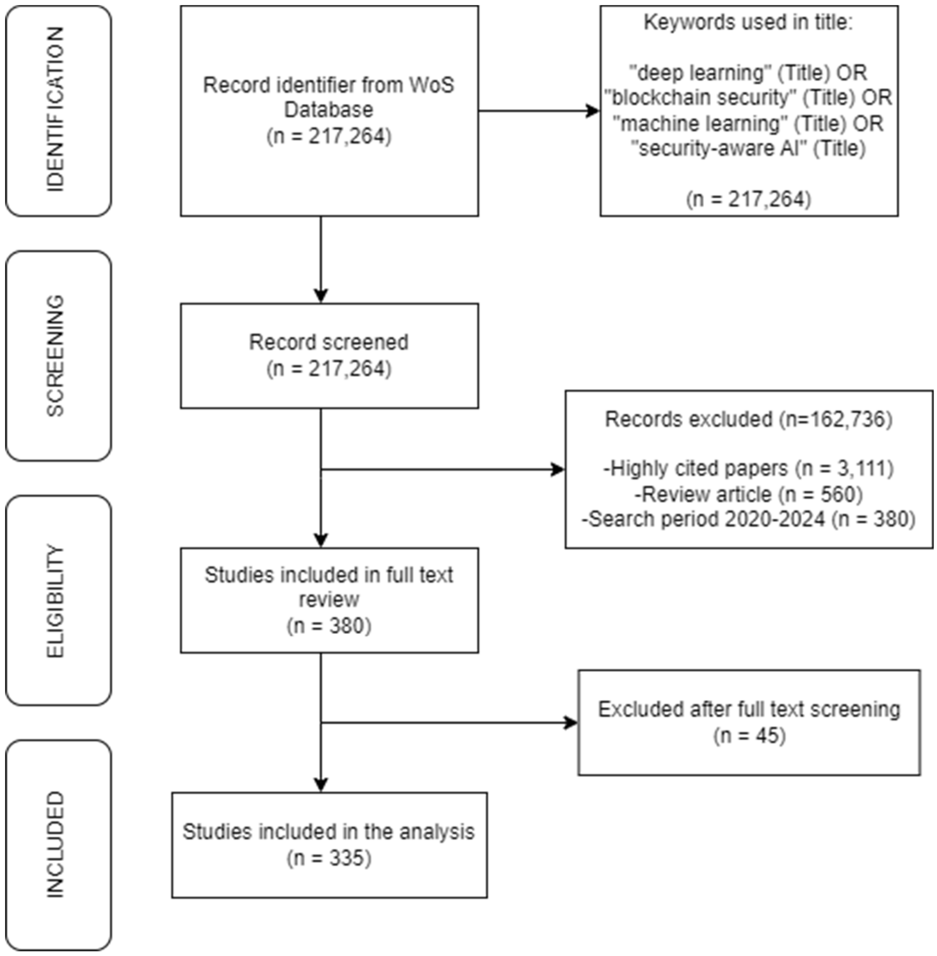

Figure 1. PRISMA flowchart (adapted from Page et al. [16]).

2.1. *Defining the Research Question*

In this step, the research question is defined. According to Arksey and O'Malley [17] this research aims to examine the available scientific papers and determine the extent of representation of research on the topic of artificial intelligence and its impact. Our research question is: What has been researched in the last few years based on the given keywords on the subject of artificial intelligence and what are the trends in this field?

2.2. *Defining Search Sources*

In order to review several AI papers, the Clarivate Analytics Web of Science (WoS) database was selected, as an initial survey (217,264) of sources showed that it contains a significant number of top scientific papers relevant to the research field. This justifies the use of WoS as a data collection source.

2.3. *Defining a Search*

Keywords and their meaningful combinations are defined here. Based on the research findings of Ahmed et al. [18], we chose keywords (such as machine learning, deep learning, etc.) which are strongly associated with AI as supplementary subject retrieval words to increase the comprehensiveness of the retrieved data. Search queries were performed using keywords "deep learning" (title) OR "blockchain security" (title) OR "machine learning" (title) OR "security-aware AI" (title). This was the first step in reviewing the total literature that mentions this topic. In later steps, the number of results obtained from the initial search was reduced by using filters that helped to reduce all results to those completely relevant to the research topic.

2.4. Conducting a Search

The search process was conducted according to the defined query in Section 2.3. We used Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) to comprehensively summarize previously published studies. The PRISMA guidelines include three phases: identification, screening, and inclusion [16]. Figure 1 shows the selection process. Article searches and data collection were performed in February 2024.

In the initial search, a set of 217,264 papers was obtained, but the keywords were searched only in the title to select only relevant papers, and not some that only mention those words. In addition, the authors of this paper refined the initial search results by including only papers that were selected as "highly cited papers" and the number of results dropped to 3111. The next filter we used was "document types: review article", and, in that step, only 546 papers were selected. All the papers that we selected were written in English so that we could easily analyze the quality of the papers. The search period covered the last couple of years in the WoS database, i.e., from 2020 to 2024. We received a total of 380 papers for our analysis.

2.5. Evaluation of the Quality of Results

The next step was to assess the quality of the data found and their significance was assessed according to Kitchenham, Mendes, and Travassos [19]. After a detailed review of the selected papers, the initial set of publications was reduced to 335 papers.

2.6. Primary Analysis of Scientific Papers

The necessary data were extracted according to the research question, and the entire search and selection process is visible in Figure 1. Papers were reviewed according to Web of Science categories, authors, affiliations, publication years, countries/regions, publishers, research areas, and citations by year. Bibliometric data analysis was performed with visualization of the results. During this step, several tools, such as VOSviewer version 1.6.20 [20,21], Microsoft Excel v2407, RStudio 2023.12.1 Build 402, and Biblimetrix (Boblioshiny) 4.1.4 [22,23], were used to analyze, map, and visualize the bibliometric data.

2.7. Detailed Analysis of Scientific Papers

In this step, a detailed analysis of the selected papers was performed by reading the full text of the selected papers.

2.8. Writing a Review Report

A review report was written and a discussion was held.

3. Overview of the Results

Figure 2 shows the data that we will analyze in this paper. These data were extracted from the Web of Science platform and analyzed with the help of RStudio.

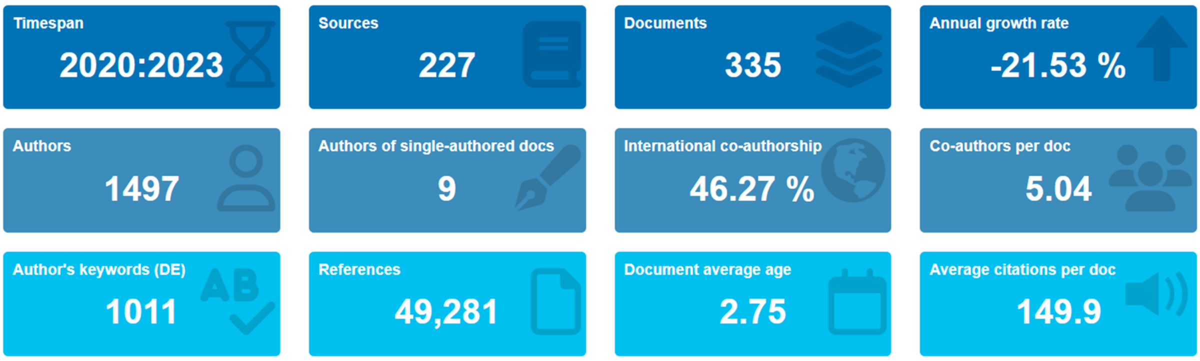

Figure 2. Main info.

By analyzing the data for the period from 2020 to 2023, a significant decrease in the number of documents was observed, resulting in a negative annual growth rate of −21.53%. This rate represents the average annual decrease in the number of documents during the analyzed period. For example, taking the year 2020 as a base year with a certain number of documents, the annual growth rate of −21.53% indicates an average decrease of 21.53% in the number of documents each year compared to the previous year. This decrease may be due to various factors, such as changes in the data collection methodology, shifts in research trends, or other factors affecting document production. It is important to note that understanding this decrease has implications for interpreting the results and tracking trends in the analyzed research.

3.1. Keywords

In the center of the diagram in Figure 3, three main keywords that actually describe artificial intelligence (and their mutual connections with other keywords) stand out, namely:

- Machine learning;
- Classification;
- Deep learning.

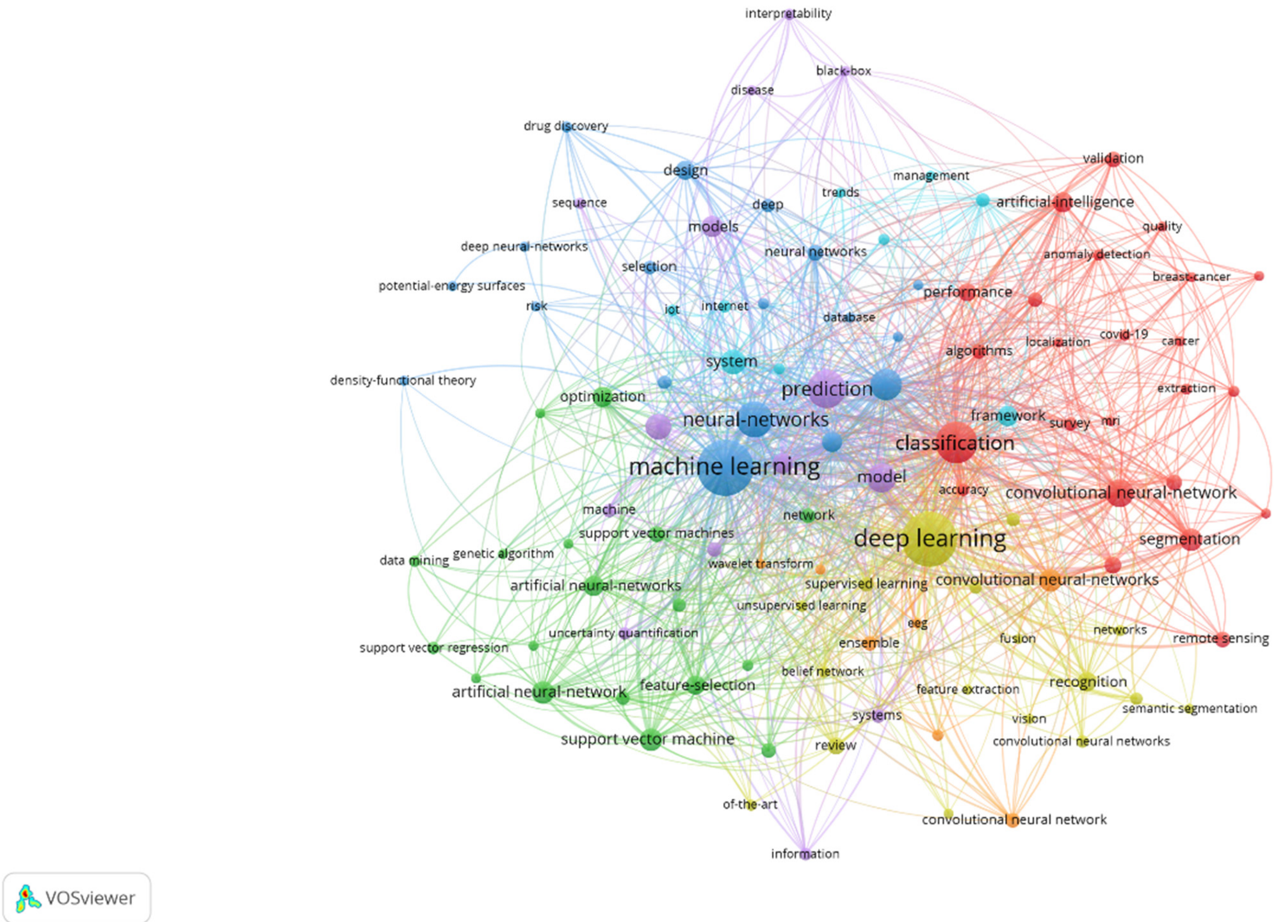

Figure 3. Displaying keywords.

These three main keywords that we can see in the diagram represent the basis of understanding and applying artificial intelligence in today's world. To understand these keywords, we need to describe or define them to continue with this paper.

3.1.1. Machine Learning

Machine learning represents the basic mechanism of learning systems to recognize patterns and make decisions based on data [24]. That is, the ability of computers to acquire and accept new knowledge and skills through experience. Machine learning is a subspecies of artificial intelligence whose task is to create a system that learns [25], where it finds conclusions and is prone to change without being explicitly (explicitly) programmed. Some of the definitions of machine learning say that it represents the design of computer algorithms that use experience when making future decisions [26].

3.1.2. Classification

The importance of "classification" is emphasized as one of the key segments in the application of artificial intelligence [27]. Through the application of deep learning algorithms, a system can accurately classify data based on its characteristics, enabling the identification of hidden patterns and connections that might be missed by the human eye. This classification process ensures improvement in various domains, from image recognition to text analysis [28], contributing to more efficient decision-making and real-time process optimization.

3.1.3. Deep Learning

Deep learning allows computer models to learn about complex data through multi-layered processing [29]. Deep learning revolutionized the technology of speech recognition, visual object recognition, and object detection. It has also made significant contributions in domains such as drug discovery. Using back-propagation algorithms, deep learning discovers complex structures in large datasets and adjusts the machine's internal parameters for better representations [30]. Convolutional networks are particularly useful for image, video, speech, and audio processing [31], while recurrent networks are effective in working with sequential data such as text and speech [30,32].

We must also mention that artificial intelligence is a term that is often mentioned in media and we need to explain what it means. Artificial intelligence is a concept that includes a large number of concepts from computer science, generally speaking, of mechanisms that use stochastic methods, that is, methods of randomness [33]. A subset of artificial intelligence is machine learning [34], which has gained great popularity among scientists and engineers, with a large number of free tools to work with. The function of machine learning is to enable a computer to perform tasks without additional programming [35]. Another branch of artificial intelligence is deep learning, whose main characteristics are multi-layer neural networks [36]. Neural networks represent a system consisting of a certain number of interconnected nodes where each node has its local memory in which it remembers the data it processes [37].

In short, the artificial intelligence ecosystem includes interrelated concepts like learning, intelligence, and deep learning, so it is no surprise why these words appear most often when it comes to artificial intelligence. This interaction shapes the modern paradigm of technological development [38], the application of which is becoming increasingly important in various areas of human life, from health to transportation, and from education to industry [39].

3.2. Categories

Analyzing the categories of scientific journals, we can see that various scientific journals appear. In addition to those shown in Figure 4, we had more categories but selected the following top 10 categories.

Figure 4. Categories of scientific journals.

1. Computer Science—Artificial Intelligence (44 papers): This category includes research that focuses on the development and application of artificial intelligence in computer science. Papers written in this area explore algorithms, machine learning, and deep learning techniques to develop intelligent systems capable of self-learning, inference, and decision-making.
2. Computer Science—Interdisciplinary Applications (29 papers): This category includes research that combines computer science with other disciplines to solve complex problems. Scientific papers in this field explore the application of computer techniques and algorithms in various fields such as health, economics, and sociology, among others.
3. Computer Science—Information Systems (19 papers): This category includes research that focuses on the development, implementation, and management of information systems. Scientific papers in this area explore how information technologies can be used to efficiently collect, process, store, and distribute information in organizations.
4. Energy Fields (19 papers): This category includes research dealing with various aspects of energy, including renewable energy sources, energy efficiency, energy distribution, and the sustainability of energy systems.
5. Engineering—Electrical Electronic (35 papers): This category includes research that focuses on electrical and electronic engineering, including the development of electrical systems, electronic components, telecommunications, control systems, and other related fields.
6. Geoscience—Multidisciplinary (22 papers): This category includes research dealing with various aspects of geoscience, including geology, geophysics, geochemistry, and other disciplines that study the structure, evolution, and processes on Earth and other planets.
7. Environmental Science (20 papers): This category includes research that focuses on the study of the environment, including ecology, environmental protection, natural resource management, and sustainable development.
8. Chemistry—Multidisciplinary (18 papers): This category includes research dealing with various aspects of chemistry, including the synthesis and characterization of chemical compounds, physical chemistry, organic and inorganic chemistry, analytical chemistry, and other disciplines.
9. Materials Science—Multidisciplinary (17 papers): This category includes research that focuses on the study of materials and their properties, including the synthesis, characterization, processing, and application of various materials in various industries.

10. Engineering—Biomedical (14 papers): This category includes research that deals with the application of engineering principles and technologies in medicine and biology. Scientific papers in this field explore the development of medical devices, diagnostic techniques, therapeutic methods, and other innovations that contribute to medical practice and health care.

Based on the number of scientific papers presented in different categories, it can be concluded that there is diversity in the research and interest from the scientific community and public in different fields. This leads to the confirmation that artificial intelligence is present in all fields and can be applied in various ways. An increased number of papers in certain categories may indicate active research and development in those areas, while, on the other hand, a lower number of papers may indicate a less researched or less popular field. In addition, certain areas may overlap or complement each other, which can affect the total number of papers. Through bibliometric analysis, the dynamics of the development of scientific disciplines can be seen and areas that require more research and attention from the scientific community in the future can be identified. The conclusion that can be drawn is that the first three categories, which include computer science, have the most scientific papers due to the active research and widespread application of artificial intelligence, information technology, and interdisciplinary applications in various fields. These areas are currently in the spotlight due to their high relevance and impact on various industries and disciplines. On the other hand, we have the category Engineering—Biomedicine, which has the smallest number of papers due to its specificity and potential limitations in research. The reason for this may be the high costs of research and the need for specialized knowledge and equipment. We must also mention the strict regulation in health sciences. This may limit the number of researchers and institutions involved in this field and the result would be a lower number of scientific papers compared to other categories.

3.3. Publications

The number of publications by year in Figure 5 shows the dynamics of research activity during the last four years. The increase in the number of publications from 2020 to 2021 can be interpreted as a result of intensive research and investment in scientific projects, which may have been stimulated by global events such as the COVID-19 pandemic [40] or other factors that may have increased interest in certain topics. However, we also have a decline in the number of publications in 2022 and 2023, which may indicate a possible trend of decreasing research activity or changing priorities in research. These numbers may be due to a variety of factors, including changes in research funding, institutional policies, resource diversion, or changes in the interest of researchers and the scientific community. Also, the lower number of publications in 2022 and 2023 may be the result of the time lag between conducting research and publishing papers. All these factors should be taken into account when analyzing the dynamics of research activity and planning future research and projects.

A decrease in the number of publications during a certain period can have a significant impact on the scientific community and the further development of research. A smaller number of published papers can contribute to slower progress in certain scientific disciplines, because the reduced volume of research results limits the availability of new research results, knowledge, and ideas in those fields. In addition, the reduction in the number of publications can have the effect of creating a gap in the literature and limit the diversity and access to certain fields. The lack of new research can slow down innovation and make it difficult to make new discoveries or develop new technologies, and also to present the achieved results. Also, fewer publications can have consequences for researchers' careers, especially for young researchers who rely on publications to advance their careers. The lack of opportunities to publish papers can limit the opportunities for obtaining financial support, creating scientific connections, and building the advancement of knowledge in one's field. However, reducing the number of publications may also encourage researchers to focus on quality instead of quantity, which may result in deeper and more thorough research. Also, it can encourage researchers to consider new approaches and methodologies in their scientific papers, which can lead to creative solutions and innovations.

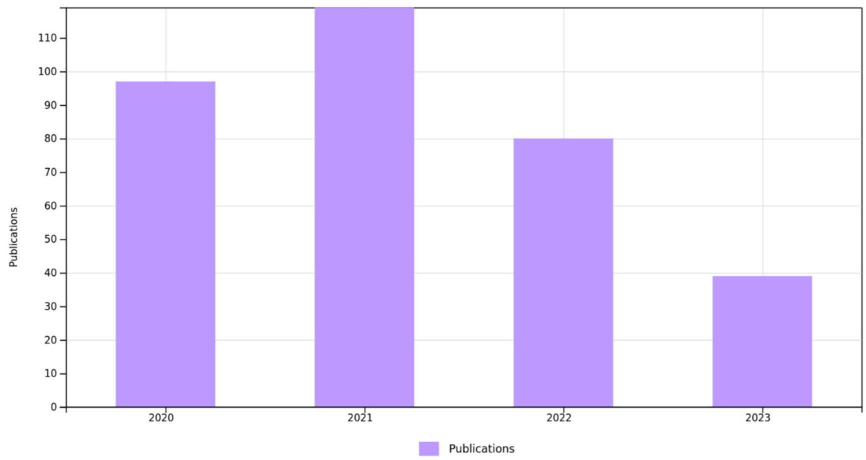

Figure 5. Number of publications.

In conclusion, it is important that the scientific community recognizes the challenges that the reduction in the number of publications can bring and works together to find solutions to support the continued progress and development of science.

3.4. *Areas of Research*

Analyzing Table 1, the number of papers in different fields provides insight into the diversity of the interests and focuses of the scientific community. The high number of papers in fields such as computer science can be explained by the wide application of these disciplines in various industries and areas of life, and also by the constant technological progress that requires constant development, research, and innovation. On the other hand, the smaller number of papers in areas such as biochemistry and molecular biology may be the result of the specificity of these disciplines, or the complexity of the research, as well as the smaller number of researchers dealing with these topics. Also, fields such as geology, physics, and energy may have a smaller number of AI-related papers compared to other disciplines of lesser interest. However, it is important to note that the number of researchers in a particular field may vary from year to year, depending on current trends, financial support, institutions, and other factors.

Table 1. Areas of research.

Areas of Research	Number of Papers	%
Engineering	94	28.060
Computer Science	88	26.269
Chemistry	31	9.254
Environmental Sciences Ecology	23	6.866
Geology	22	6.567
Physics	21	6.269
Science Technology Other Topics	21	6.269
Energy Fuels	19	5.672
Materials Science	17	5.075
Biochemistry Molecular Biology	15	4.478

Source: Author's own calculations.

3.5. Countries

The number of papers by country provides an insight into the activities of the research community around the world. China and the United States of America stand out as leaders in the number of papers [41], which is probably the result of their large population, wealth of resources, high investment in science and technology, and developed research infrastructure. Great Britain also has a significant amount of research, which may be the result of a rich scientific tradition, with renowned universities and institutions.

Countries like India, Australia, Canada, and Germany are also significant in the research community, with a solid amount of research. The numbers found may be the result of the population size, level of economic development, political priorities, or specific scientific interests of these countries. Iran, Singapore, and South Korea have a lower number of papers compared to the previously mentioned countries but are still significant in the global research community. These numbers may be a result of the relatively smaller populations of these countries or limited research resources.

The number of papers by country reflects the diversity of research papers around the world, with different countries contributing to scientific discoveries in different areas, according to their resources, priorities, expertise, specific characteristics, interests and capabilities.

In addition to the graph shown in Figures 6 and 7, we have also attached a map where you can see all the countries included in our filtering. We repeat, China and the United States of America stand out with great dominance, marked in darker blue.

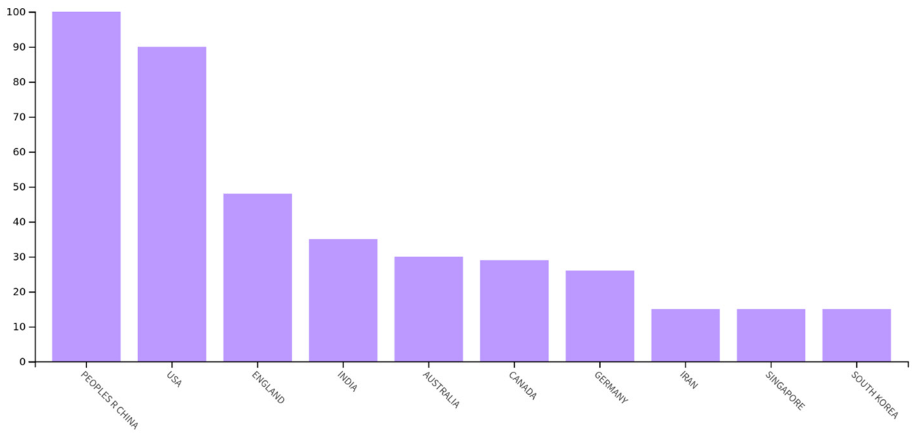

Figure 6. Countries.

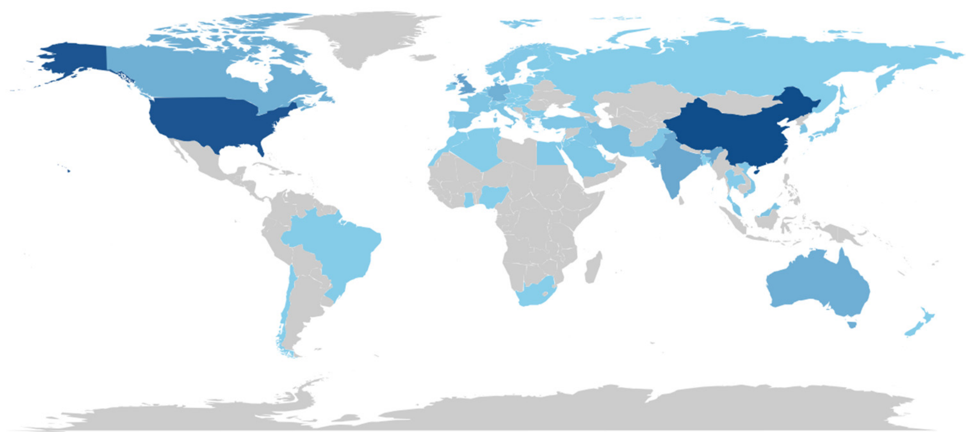

Figure 7. Country map.

In Figure 8, we can see that the United States of America was ahead of China from 2020 to mid-2022, while, from the middle of 2022, China took the lead [42]. Other selected countries had a slight increase in the number of scientific papers. It should also be noted that bilateral international visitation and academic exchange between the US and China have both significantly reduced, leading to a decline in Sino–American scientific collaboration. The number of American international students from China decreased by nearly 22%, while the number of American students studying in China dropped to only 1.8% of the 2018–2019 level. Despite this decline, influential research collaborations between the two nations remain consistently high [43].

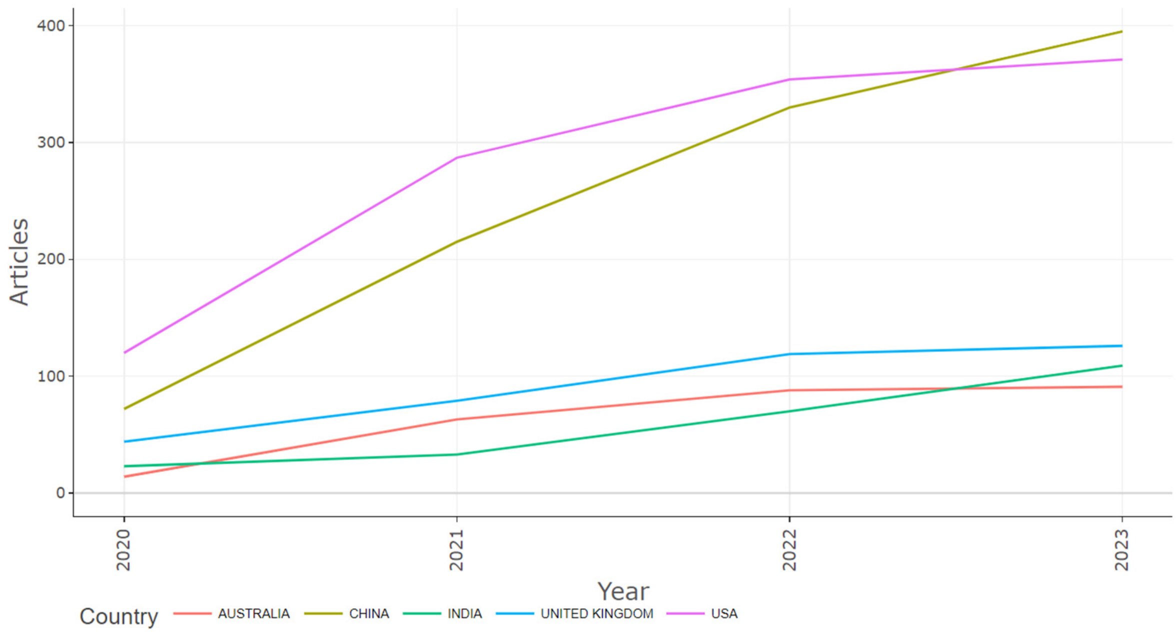

Figure 8. Overview of the number of papers by country and year.

The growth line for India is interesting, where continuous growth can be observed in the period from 2021 to 2023. On the other hand, Great Britain had an increase in the number of scientific papers in the period from 2020 to 2022, and, in the period from 2022 to 2023, the number of scientific papers was constant. The growth of the number of scientific papers from year to year is increasing, which indicates continuous progress in scientific research and activities to us. Growth can be the result of various factors, including technological progress, access to data, and the collaboration of scientific workers from all over the world.

3.6. Citations

Based on the citation trends of the last few years, 2024 represents a challenging and dynamic time in the world of scientific research. Although the number of citations in 2024 shown in Figure 9 is currently at the level of 1,000, it should be noted that this year has just begun and further growth in citations is expected as researchers publish new papers and their results become available to the general public. The previous trend of citation growth, especially the sharp increase from 2021 to 2023, suggests continued interest and activity in the scientific community. This increase may be the result of intensive research activities, increased cooperation between researchers and institutions, and the development of new technologies and methodologies that have stimulated progress in various fields of science. The period between 2020 and 2023 was marked by significant events and changes in the world, some of which directly affected the dynamics of scientific activity.

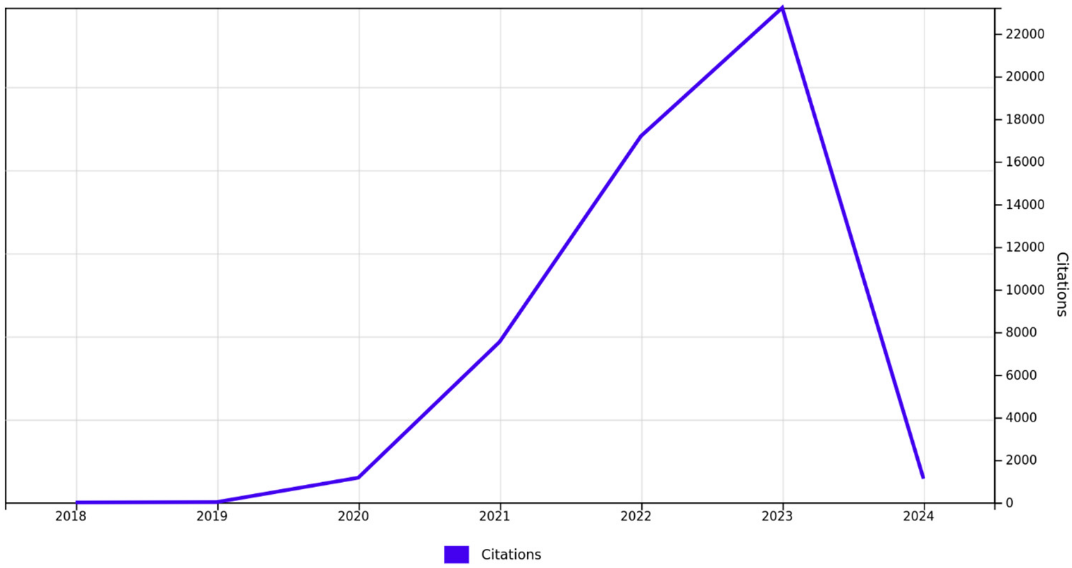

Figure 9. Number of citations.

RStudio displayed the years 2018 and 2019 with a value of 0 because these years were not included in our analysis. Alternatively, it is possible that there was an error in the Web of Science (WoS) in displaying the publication period.

Considering that the number of citations in 2024 is currently at the level of 1000, it can be assumed that this number will increase as researchers publish new papers and as these papers are integrated into existing scientific discourses. It is expected that the further development of research topics, technologies, and methodologies will contribute to the further growth of citations and the continuation of scientific progress in the future.

The Figure 10 shows the data as interpreted by RStudio. We assume that full surnames are displayed in combination with the first letter of the name. For example, "ZHANG Y" would refer to a person with the surname Zhang and the first letter of the name being Y. Based on this format, the data were organized and displayed in a graph.

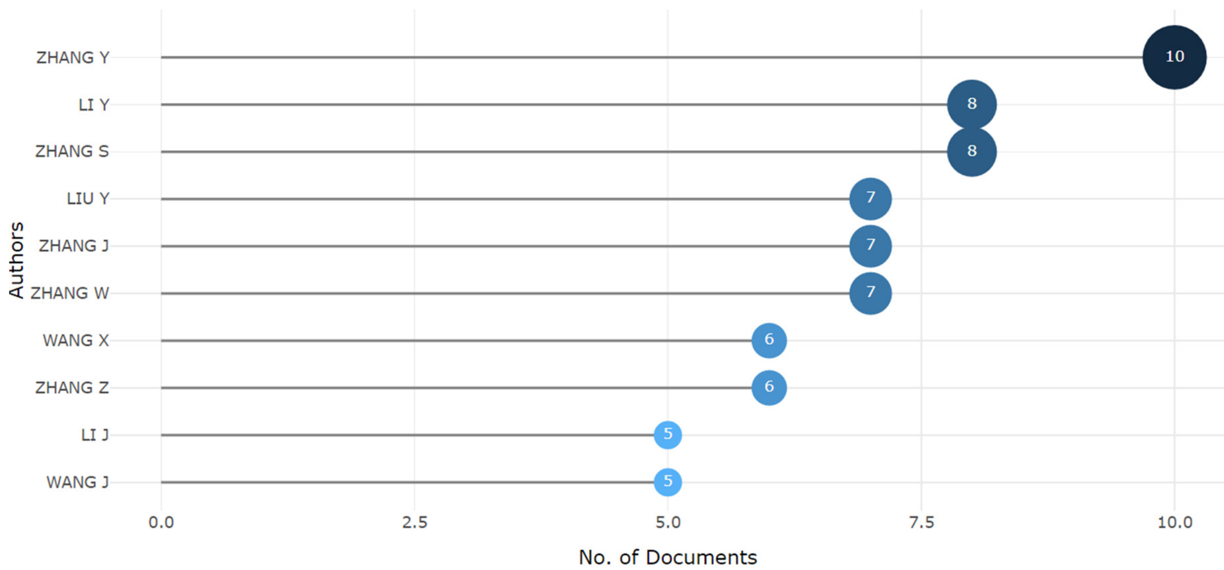

Figure 10. The most relevant authors.

3.7. Top Five Scientific Papers by Citations

In the period from 2020 to 2024, five scientific papers dealing with different aspects of machine learning were presented as. Shown in Table 2 The first article, "Review of deep learning: concepts, CNN architectures, challenges, applications, future directions" [44], recorded a constant growth of citations during the period, with a peak in 2023. Another article, "Physics-informed machine learning" [45], showed a significant increase in citations between 2020 and 2023. The third article, "Applications of machine learning to machine fault diagnosis: A review and roadmap" [46], recorded a gradual increase in citations throughout the period. The fourth article, "Machine Learning for Fluid Mechanics" [47], showed a steady level of citations over the years. The fifth article "Deep Learning for Anomaly Detection: A Review" [48] showed a significant increase in citations since 2021. The increase in the citation of these articles since 2021 can be attributed to the increasing popularity of artificial intelligence. From the end of 2021, artificial intelligence has become increasingly significant and present in various spheres of life, from technological innovations to everyday applications and changes, both in science and in practice. The increasing popularity of artificial intelligence has probably led to an increased interest in research and the application of machine learning, which is reflected by the increase in the number of citations for the analyzed articles. These articles, covering various aspects of machine learning, are becoming more relevant and in demand as artificial intelligence is increasingly integrated into our daily lives. The rise in the popularity of artificial intelligence is certainly due to OpenAI's ChatGPT, which appeared at the end of November 2022 [49].

Table 2. Papers and their citations.

Article	2020	2021	2022	2023	2024	Average per Year	Total
Review of deep learning: concepts, CNN architectures, challenges, applications, future directions	1	66	439	845	45	349	1.396
Physics-informed machine learning	0	35	485	777	33	332.5	1.330
Applications of machine learning to machine fault diagnosis: A review and roadmap	64	254	370	401	16	221	1.105
Machine Learning for Fluid Mechanics	88	247	347	361	17	213	1.065
Deep Learning for Anomaly Detection: A Review	1	112	266	311	13	175.75	703

Source: Author's own calculations.

4. Discussion

The importance of published papers and their impact on the scientific community can be viewed from several perspectives. First, published papers represent research results that contribute to the spread of knowledge and understanding in a particular field. By sharing new knowledge, researchers enable other scientists to expand their understanding, develop new theories or methods, and further explore topics covered in published papers. In addition, published papers are crucial for the academic reputation and advancement of scientists. Through the citation and recognition of their scientific papers by peers, scientists build their reputation in the scientific community, which can have a direct impact on their ability to obtain financial support for further research, access better resources, or advance their careers. Published papers have a significant impact on the improvement of educational institutions. By integrating the latest research results into teaching, educational institutions enable students to follow current trends and develop competencies that are relevant to the modern labor market. Published papers can serve as a basis for the development of new curricula or program areas, adapted to rapid changes in technology, scientific methodology, or social needs. In short, published papers are a pillar of the scientific community and a key element in the process of knowledge exchange, the development of scientists, and the improvement of educational institutions. Their importance lies in their ability to stimulate further research, enhance academic reputation, and enrich educational programs with the latest knowledge and perspectives.

5. Conclusions

The analysis of the dynamics of research activity, the number of publications by year, research area, countries, and citations provides deeper insight into the global picture of the scientific community and its current trends. The COVID-19 pandemic had a significant impact on research activity, resulting in a sharp increase in published papers in 2020 and 2021. However, the decline in the number of publications in 2022 and 2023 suggests a possible trend of reduced activity or a change in research priorities. The diversity of the interests and focuses of the scientific community is reflected in the number of papers in different fields. The high number of papers in fields such as engineering and computer science shows the wide application of these disciplines, while the lower number of papers in fields such as biochemistry may be the result of the specificity and complexity of the research in said field.

5.1. Theoretical Implications

From our findings, we concluded several important things that can help researchers understand how popular a paper is and how many times it has been cited. These results can be useful for researchers to explore new areas and find faster solutions to problems related to scientific papers popularity.

5.2. Practical Implications

Our results may be useful to researchers who want to expand their knowledge. For practitioners such as computer scientists seeking technological advancements, the research findings provide a deeper understanding of the challenges associated with scientific papers in specialized fields such as artificial intelligence.

5.3. Limitations and Future Research

This study is limited by some methodological obstacles that can be overcome by future research. We used one database for bibliometric analysis, which essentially reduced the number of papers that could be analyzed. The research period was limited to the last few years, and it would be interesting to see how much research has been carried out on this topic in the last few decades and how much of an influence these scientific papers have had on the development of this topic in scientific and professional circles. In this research, we used the WoS core collection, and for more data and future analysis, it would be useful to include other databases that could display more works and therefore give other results. This can potentially be a big challenge due to the inconsistency of data in different databases, and, for this reason, we have currently opted for the WoS database, which indexes the highest quality works. In the future, we will pay attention to this case and try to extract the maximum amount of data from other databases that are available to us at that moment. Future research should explore the impact of emerging technologies on research dynamics, such as artificial intelligence and machine learning, to see how they might change the landscape of bibliometric analysis. Additionally, investigating the effects of funding policies on publication rates could provide valuable insights into how financial support influences research output.

Overall, this analysis provides useful insights for researchers and institutions to better understand current research trends and identify areas that require additional attention and support in the future. In future research, we plan to use various databases and methods to better understand the complexity of the research environment.

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