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Bibliometric Overview of ChatGPT: New Perspectives in Social Sciences

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Abstract: This study delves into a bibliometric analysis of ChatGPT, an AI tool adept at analysing and generating text, highlighting its influence in the realm of social sciences. By harnessing data from the Scopus database, a total of 814 relevant publications were selected and scrutinised through VOSviewer, focusing on elements such as co-citations, keywords and international collaborations. The objective is to unearth prevailing trends and knowledge gaps in scholarly discourse regarding ChatGPT's application in social sciences. Concentrating on articles from the year 2023, this analysis underscores the rapid evolution of this research domain, reflecting the ongoing digital transformation of society. This study presents a broad thematic picture of the analysed works, indicating a diversity of perspectives—from ethical and technological to sociological—regarding the implementation of ChatGPT in the fields of social sciences. This reveals an interest in various aspects of using ChatGPT, which may suggest a certain openness of the educational sector to adopting new technologies in the teaching process. These observations make a contribution to the field of social sciences, suggesting potential directions for future research, policy or practice, especially in less represented areas such as the socio-legal implications of AI, advocating for a multidisciplinary approach.

Keywords: ChatGPT; artificial intelligence; bibliometric analysis; ethical implications; educational technology; interdisciplinary research

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1. Introduction

The evolution and widespread adoption of artificial intelligence (AI) in recent years has led to a considerable reshaping of the services offered across industries, from medical diagnostics to advanced manufacturing processes. Emerging information technologies and the introduction of AI-powered cognitive machines have significantly changed the way people live and work [1]. As this technology continues to advance, more and more companies are exploring ways to integrate their own systems with AI. Chatbots are one such technology that has gained popularity among various organisations around the world. These are automated systems that use natural language processing (NLP) algorithms capable of simulating conversations with humans, providing instant support to customers [2]. One of the most popular chatbots at the moment is ChatGPT (Generative Pre-Trained Transformer). It is an extended language model launched by the Open Artificial Intelligence (OpenAI) organisation in November 2022. Free access and ease of use have made it one of the most widely used platforms for interacting with artificial intelligence worldwide [3]. OpenAI currently records 1.4 billion visits to the chatbot's official website each month. The largest target group (34.5%) of this platform comprises people between the ages of 25 and 34 [4].

In the field of social science, tools based on artificial intelligence, such as ChatGPT, have the potential to transform not only methods of analysis but also fundamental epistemological assumptions. Numerous studies have suggested that the implementation of artificial intelligence can revolutionise the process of scientific discovery, significantly

affecting the structural organisation of scientific disciplines [5]. Artificial intelligence's ability to process massive data sets can uncover hidden correlations and insights, potentially leading to breakthroughs in understanding complex phenomena. Moreover, artificial intelligence can automate routine scientific tasks, allowing researchers to focus on creative and analytical processes [6]. As artificial intelligence systems become more integrated into research workflows, they can significantly change the structural organisation of scientific disciplines, promoting interdisciplinary collaboration and potentially leading to new paradigms in scientific research [7,8]. The bibliometric analysis of tools such as ChatGPT in social science can provide important clues about future trajectories for the development of the tool. However, despite significant progress in research on the application of AI in specific fields, there is still an urgent need for a deeper understanding of the mechanisms of its implementation and its impact on diverse scientific research sectors [9].

Following the above considerations, this study presents a bibliometric analysis of scientific papers from the field of social science concentrated on the use of the ChatGPT tool. In light of the multidimensionality of the topic, the following research questions were posed to focus this study:

1. What is the current state of knowledge on the use of ChatGPT in social science?
2. What are the main trends and future developments in the use of ChatGPT in social science?
3. What potential research directions can be identified for the future?

Taking into account the research questions formulated, this study aspires to become a major contribution to the development of knowledge, especially in the area of social science. This paper has the potential to promote interdisciplinarity by demonstrating the opportunities for collaboration and knowledge exchange between different scientific disciplines that can arise from the integration of tools such as ChatGPT. Seeking a deeper understanding of the possibilities and limitations of AI in the context of social science can foster the better adaptation of these tools, addressing specific research needs in the field.

In the context of this research, the classification according to UNESCO was used to define the scope covering social sciences. According to this division, social sciences include the following: psychology and cognitive sciences; economics and business; education; sociology; law; political science; social and economic geography; media and communications; and other social sciences [10].

There are many bibliometric studies in the area of using the ChatGPT tool. This issue has been addressed by Khosravi et al. [11], Baber et al. [12], Barrington et al. [13], Zheltukhina et al. [14], Farhat et al. [15], Liu et al. [6] and others. This article stands out in the field of bibliometric research due to its specific focus on ChatGPT in the social sciences.

In the long run, this study may serve as a catalyst for further innovation, identifying potential research directions and areas where ChatGPT and other AI tools can contribute to the development of new theories, models and research approaches. In doing so, not only does this paper point to current trends, but it also opens the door to future explorations that can significantly influence the shape and quality of research in social science.

The following article consists of several sections. Section 2 presents the research methodology, detailing the analytical techniques and criteria used in the bibliometric analysis of ChatGPT's impact on the social sciences. Section 3 presents the results of this study, presenting data and insights on current trends and the state of the art in the field. Section 4 includes a discussion, contextualising the results in the broader context of social science research and examining their implications. The article concludes with Section 5, summarising key insights, acknowledging limitations and suggesting directions for future research, thus summarising this study's contribution to understanding the role of artificial intelligence in the social sciences.

2. Materials and Methods

This paper attempts to identify current trends and cognitive gaps in the existing literature on the use of the ChatGPT tool in the field of social science. In order to provide

a sound empirical base for the results presented, the bibliometric analysis methodology was used. This study method provides the identification, structuring and evaluation of components specific to the chosen area, thus constituting a key tool in the scientific literature review process [16]. Furthermore, it allows for the identification of significant gaps in current studies, which constitute a barrier to further development in understanding the analysed phenomenon [17].

2.1. Structure of This Study

This study was divided into three phases that complement each other, and their synthesis constitutes a comprehensive assessment of the current body of literature on the use of the ChatGPT tool in the field of social science.

2.1.1. Collection of Bibliographic Data

This stage of the study involves the creation of a bibliographic database that is relevant to the topic of the study. This process involves the identification, selection and collection of scientific papers that contain information on the use of the ChatGPT tool in the field of social science. The Scopus bibliographic database, which allows for efficient searching of the scientific literature, was used to complete this stage [18].

The Scopus database is recognised as one of the key platforms for conducting bibliometric analyses. Its advantages include a broad thematic scope and high frequency of updates, which are crucial in dynamically developing scientific disciplines. Scopus offers comprehensive citation analysis tools, enabling a detailed assessment of the impact of individual publications [19]. The functionality of data export facilitates easy data collection and analysis. On the other hand, limitations of Scopus include a smaller historical range compared to that of some other databases and greater selectivity in source selection, which may lead to certain biases in material selection. Despite these limitations, Scopus is often chosen due to its advantages, especially in research where timeliness and broad thematic coverage are priorities [19].

2.1.2. Transformation and Statistical Analysis of the Data by VOSviewer

At this stage of the study, the collected data are transformed to prepare them for statistical analysis. As part of this process, some of the data will be transformed using VOSviewer (version 1.6.19.), including the data on co-citations, keywords and international cooperation. This is followed by a statistical analysis of the data, which allows for the identification of the main trends, patterns and relationships found in the literature under study [20].

In the context of this study, VOSviewer is the preferred choice because of its strong visualisation capabilities. This feature is particularly helpful in mapping the extensive and complex network of citations and collaborations in this rapidly evolving field. VOSviewer's user-friendly interface also helps to simplify the analysis process, making it accessible even to those who may not be deeply versed in bibliometric methodologies [21].

2.1.3. Discussion, Conclusions and Recommendations

The final part of this study consists of the synthesis of the results obtained during the preceding stages. This serves as the basis for the formulation of conclusions and recommendations to present a comprehensive assessment of the current state of knowledge on the use of the ChatGPT tool in the field of social science [22]. The discussion section will analyse the identified trends, patterns and relationships in the accumulated literature. Conclusions will summarise key insights, highlighting the implications of using ChatGPT in the social sciences. Recommendations will aim to guide future research directions, suggest practical applications of the findings, and propose strategies for addressing identified gaps in the literature.

Based on the above, the structure of this study was designed to provide a comprehensive and thorough understanding of the role and impact of the ChatGPT tool in the

social science context. Not only does each stage of the study form an integral part of the research process, but it also complements the others, creating a coherent and integrated research structure.

2.2. Literature Review Protocol

In accordance with the bibliometric analysis method, the literature review protocol lies at the heart of the study of scientific publications [22]. It defines the data search parameters that the investigators include in their work. Among other things, this comprehensive protocol addresses database sequences, criteria for inclusion or exclusion of the literature and qualitative criteria [23]. The individual components of the protocol that were used to narrow down the results of the extracted publications from the bibliographic database are presented in Table 1.

Table 1. Filters used and criteria for selection of publications.

Filter	Selected Criteria
Search within	Article title, Abstract, Keywords
Search documents	"ChatGPT"
Year	2023
Subjects are limited to	Social Sciences; Business, Management and Accounting; Arts and Humanities; Economics, Econometrics and Finance; Psychology; Decision Sciences
Document type limited to	Article
Source type limited to	Journal

The protocol is a central element of the first stage of this study and serves as a tool for the efficient search and selection of the relevant literature, which provides the foundation for further stages of this study and the final synthesis of results [20]. To identify scientific articles most closely related to the desired topic, the term "ChatGPT" was used as a keyword. The research focused exclusively on scientific articles due to their recency and their significant predominance in the structure of scientific publication resources on this topic. Scientific articles allow for the precise identification of citations and co-citations, due to their indexing in databases, which was very important given the nature of the research conducted. After applying the above limitations to the Scopus database, 814 results were obtained and analysed in detail (retrieval date is 5 March 2024).

3. Results

This stage is divided into three main parts, in which the results of the bibliometric analysis studies conducted are presented. Each stage focuses on different elements of the analysis, which allows us to capture the broader context of the essence of the use of ChatGPT in the social sciences. The individual stages are as follows: analysis of citations, analysis of the source of articles and analysis of keywords.

3.1. Analysis of Citations

In order to visualise the group of most cited publications from the study area, the average number of citations was calculated for all 814 scientific articles. The average number of citations is seven (rounded to the nearest whole number) per publication. Therefore, the map shows authors whose publications have more than seven citations (Figure 1).

The map shown includes the authors of 160 scientific publications with above-average citation counts. This is 19.66% of all the articles considered in this study. Importantly, the top ten most cited publications account for 35.63% of all citations (out of 814 publications).

The analysis of citations led to the identification of the most influential papers on the application of the ChatGPT tool in the field of social science. Using the database of 814 publications, a set of the 20 most frequently cited publications was made (Table 2). The

analysis carried out made it possible to identify the key themes, methods and theories that dominate research on the use of ChatGPT in social science [24].

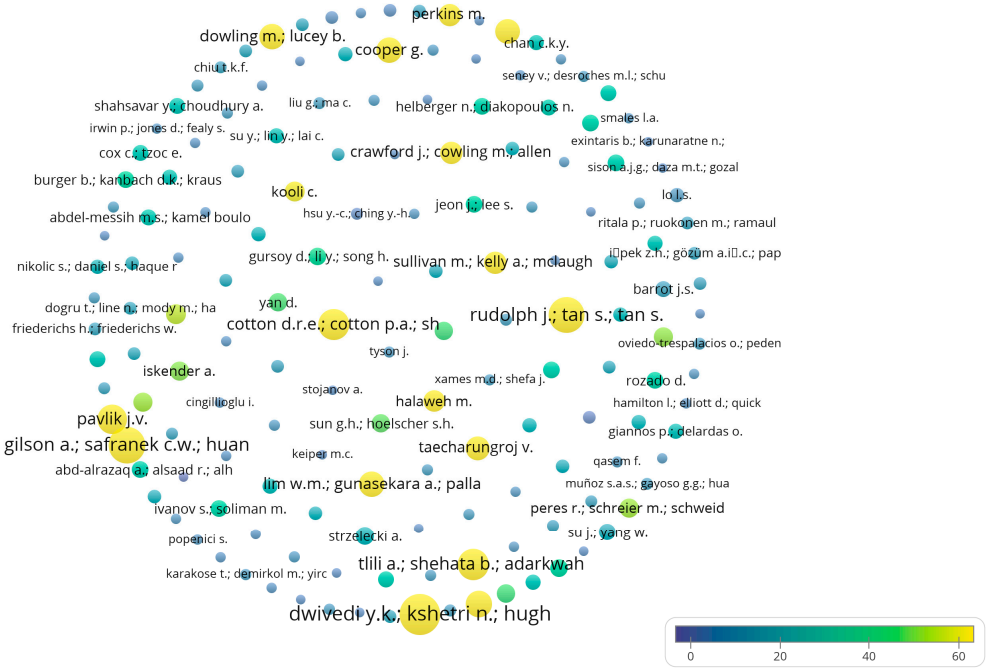

Figure 1. Map of the authors of the most cited publications in terms of ChatGPT use in the social sciences.

Table 2. The 20 most frequently cited publications on the use of ChatGPT in the field of social science.

Authors	Title of the Publication	Title of Journal	Number of Citations
Dwivedi et al. [25]	"So what if ChatGPT wrote it?" Multidisciplinary perspectives on opportunities, challenges and implications of generative conversational AI for research, practice and policy.	*International Journal of Information Management*	524
Gilson et al. [26]	How Does ChatGPT Perform on the United States Medical Licensing Examination? The Implications of Large Language Models for Medical Education and Knowledge Assessment.	*JMIR Medical Education*	369
Tlili et al. [27]	What if the devil is my guardian angel: ChatGPT as a case study of using chatbots in education.	*Smart Learning Environments*	234
Cotton et al. [28]	Chatting and cheating: Ensuring academic integrity in the era of ChatGPT.	*Innovations in Education and Teaching International*	226
Rudolph et al. [29]	ChatGPT: Bullshit spewer or the end of traditional assessments in higher education?	*Journal of Applied Learning & Teaching*	224
Pavlik [30]	Collaborating With ChatGPT: Considering the Implications of Generative Artificial Intelligence for Journalism and Media Education.	*Journalism & Mass Communication Educator*	189
Farrokhnia et al. [31]	A SWOT analysis of ChatGPT: Implications for educational practice and research.	*Innovations in Education and Teaching International*	143

Table 2. *Cont.*

Authors	Title of the Publication	Title of Journal	Number of Citations
Cooper [32]	Examining Science Education in ChatGPT: An Exploratory Study of Generative Artificial Intelligence.	*Journal of Science Education and Technology*	133
Dowling & Lucey [33]	ChatGPT for (Finance) research: The Bananarama Conjecture.	*Finance Research Letters*	131
Lim et al. [34]	Generative AI and the Future of Education: Ragnarök or Reformation? A Paradoxical Perspective from Management Educators.	*The International Journal of Management Education*	126
Rudolph et al. [35]	War of the chatbots: Bard, Bing Chat, ChatGPT, Ernie and beyond. The new AI gold rush and its impact on higher education.	*Journal of Applied Learning & Teaching*	123
Lund et al. [36]	ChatGPT and a new academic reality: Artificial Intelligence-written research papers and the ethics of the large language models in scholarly publishing.	*Journal of the Association for Information Science and Technology*	116
Taecharungroj [37]	"What Can ChatGPT Do?" Analyzing Early Reactions to the Innovative AI Chatbot on Twitter.	*Big Data and Cognitive Computing*	108
Perkins [38]	Academic Integrity considerations of AI Large Language Models in the post-pandemic era: ChatGPT and beyond.	*Journal of University Teaching & Learning Practice*	94
Crawford et al. [39]	Leadership is needed for ethical ChatGPT: Character, assessment, and learning using artificial intelligence (AI).	*Journal of University Teaching & Learning Practice*	84
Sullivan et al. [40]	ChatGPT in higher education: Considerations for academic integrity and student learning.	*Journal of Applied Learning & Teaching*	82
Halaweh [41]	ChatGPT in education: Strategies for responsible implementation.	*Contemporary Educational Technology*	80
Kooli [42]	Chatbots in Education and Research: A Critical Examination of Ethical Implications and Solutions.	*Sustainability (Switzerland)*	65
Peres et al. [43]	Editorial: On ChatGPT and beyond: How generative artificial intelligence may affect research, teaching, and practice.	*International Journal of Research in Marketing*	59
Korzynski et al. [44]	Generative artificial intelligence as a new context for management theories: analysis of ChatGPT.	*Central European Management Journal*	57

The results suggest significant academic interest in ethical issues in the context of the use of ChatGPT in research and academic education. The analysed collection is dominated by publications that anticipate significant transformations in the education system, authored by researchers such as Rudolph et al. [29], Pavlik [30] and Lund et al. [36]. Numerous scholars attempt to objectively assess the strengths and limitations of ChatGPT, identifying both beneficial and detrimental consequences of using chatbots in an educational or research context for the general public. Among them are Sullivan et al. [40] and Halaweh [41].

In order to deepen the citation analysis and gain better insight into the complex relationships between different authors in the studied area, a co-citation map was created using VOSviewer. This network visualisation is designed not only to identify key authors who have significantly contributed to scholarly discussion but also to understand how

authors are linked to each other through shared citations (Figure 2). Co-citation analysis is one of the key tools within bibliometric analysis. It is a method that allows us to understand the structure and dynamics of a given research field by identifying relationships between cited publications [45]. In practice, the frequency of co-citations can serve as an indicator of thematic affinity between studies, as well as a measure of their impact and importance in a scientific context. The findings of co-citation analysis can reveal key papers that underpin a particular area of research and indicate the existence of different schools of thought or sub-disciplines within the broader scientific field [46].

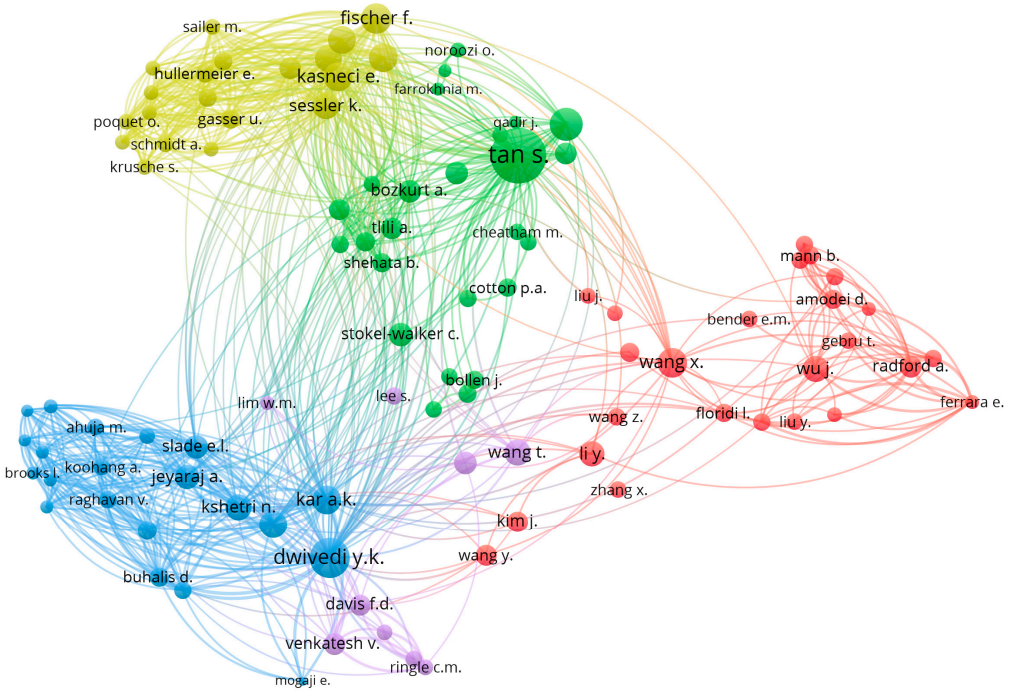

Figure 2. Map of co-citations of authors in terms of the use of ChatGPT in social sciences.

The data included in the map allow for the identification of five main clusters among cited authors. To create the co-citation visualisation, the necessary constraints related to the minimum number of required author citations (30 citations per author) were taken into account. Ultimately, 100 authors were included in the map. The highest density was identified in clusters marked in red and green, which contained 25 results each.

3.2. Analysis of the Source of Articles

The analysis of scientific journals makes it possible to identify the scientific impact of a given journal in the area under study, which is important for assessing the quality of research conducted and its recognition in the academic community. Accordingly, a map was created in which the size of the nodes indicates the number of publications in the journal, and the colour of the node indicates the sum of the number of citations of individual articles in the area of ChatGPT use in the social sciences (Figure 3).

To create the map, journals that were cited more frequently than the average number of citations of all sources (i.e., more than 14) were considered. Therefore, out of 433 sources, 75 journals were included in the map. The size of the nodes on the map reflects the number of publications in a given journal. The colour of the nodes indicates the citation totals of the publications in a given journal (focusing only on the publications that were analysed).

As far as scientific journals are concerned, their reputation and impact factor often serve as indicators of the quality and credibility of research. In addition, the thematic specialisation of journals can indicate dominant research directions and potential niches for further analysis (Table 3). In the table, information on the impact factor for the year 2023

has also been included for each of the journals (the values of the indicators were taken from Web of Science).

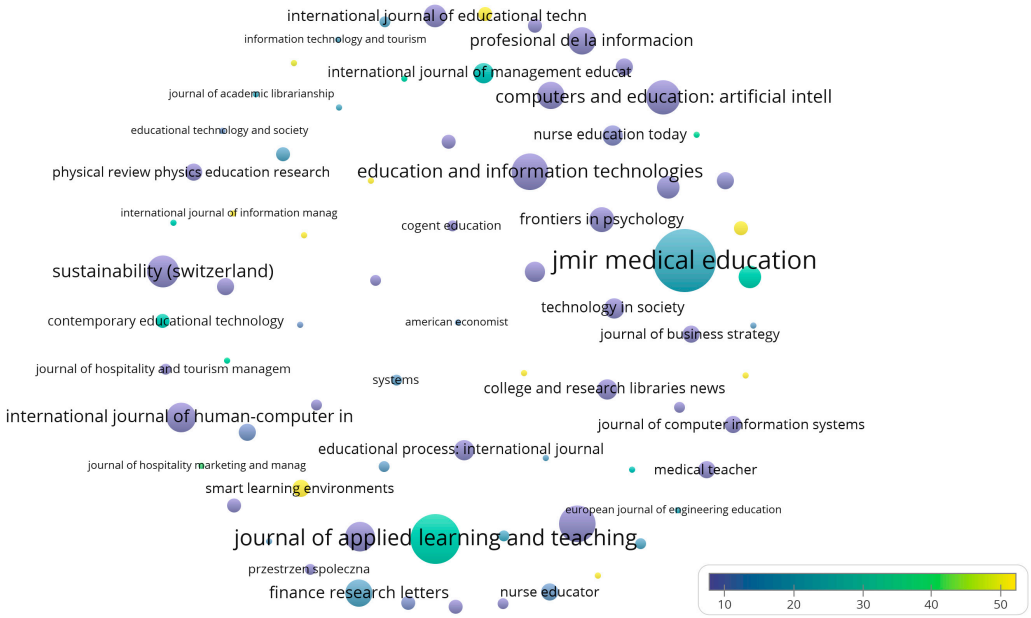

Figure 3. Map of scientific journals with the highest number of publications and most cited articles in the area of ChatGPT use in the social sciences.

Table 3. Sources containing the largest number of selected scientific publications.

No.	Title of the Journal	Impact Factor	Number of Articles
1.	*Jmir Medical Education*	3.6	27
2.	*Journal of Applied Learning and Teaching*	12.6	19
3.	*Journal of Chemical Education*	2.98	12
4.	*Education and Information Technologies*	5.5	12
5.	*Computers and Education Artificial Intelligence*	13.62	11
6.	*Sustainability Switzerland*	3.9	10
7.	*Contemporary Readings in Law and Social Justice*	3.45	10
8.	*Sistemi Intelligenti*	0.34	9
9.	*International Journal of Human Computer Interaction*	0.88	9
10.	*Australasian Journal of Educational Technology*	3.07	9

The journals where publications concerning the area under study appeared most frequently included *JMIR Medical Education*, which focuses on innovative practices and research in medical education [47]. This scientific journal featured papers by authors such as Liao et al. [48], Tangadulrat et al. [49] and Knopp et al. [50] (the cited items were selected based on the most recent publication date up to the date of extraction on 5 March 2024). *Journal Of Applied Learning and Teaching* is a journal that focuses on educational practices, emphasising higher education [51]. This journal has published articles by authors such as Gamage et al. [52], Ismail et al. [53] and Calonge et al. [54]. *Journal of Chemical Education* is the third journal in the hierarchy of the examined area that focuses on educational practices, especially in the field of chemical sciences [55]. This scholarly journal included articles by authors such as Guo & Lee [56], West et al. [57] and Clark et al. [58].

The authors' country of origin can serve as an indicator of cultural and geographical diversity, which is relevant in the context of globalisation and the increasing complexity of management problems (Table 4). Analysis of this aspect can also reveal variations in access to resources and funding, which have a direct impact on both the scope and quality of the study. The influence of a given country's science policy on research priorities and directions also cannot be overlooked [59].

Table 4. Number of authors by country/region of origin.

No.	Country/Region	Number of Authors
1.	United States	221
2.	China	81
3.	United Kingdom	67
4.	Australia	54
5.	Germany	38
6.	India	36
7.	South Korea	32
8.	Italy	32
9.	Spain	28
10.	Canada	28
11.	Hong Kong	26
12.	United Arab Emirates	24
13.	Poland	23
14.	Turkey	20
15.	New Zealand	20
16.	Saudi Arabia	19
17.	Vietnam	15
18.	Singapore	15
19.	Thailand	14
20.	Malaysia	14

Drawing on the above information, one can observe a clear dominance of authors from the United States (27.15%). This makes an important indication of the concentration of intellectual capital and research resources in this country. China (9.95%) and the United Kingdom (8.23%) also show a significant contribution to the area under study. The presence of authors from Asian countries, such as China, India (4.42%) and South Korea (3.93%), indicates the growing role of these countries in the global academic context. In order to obtain a more detailed analysis, Figure 4 presents the correlation between countries and regions in the context of the study conducted.

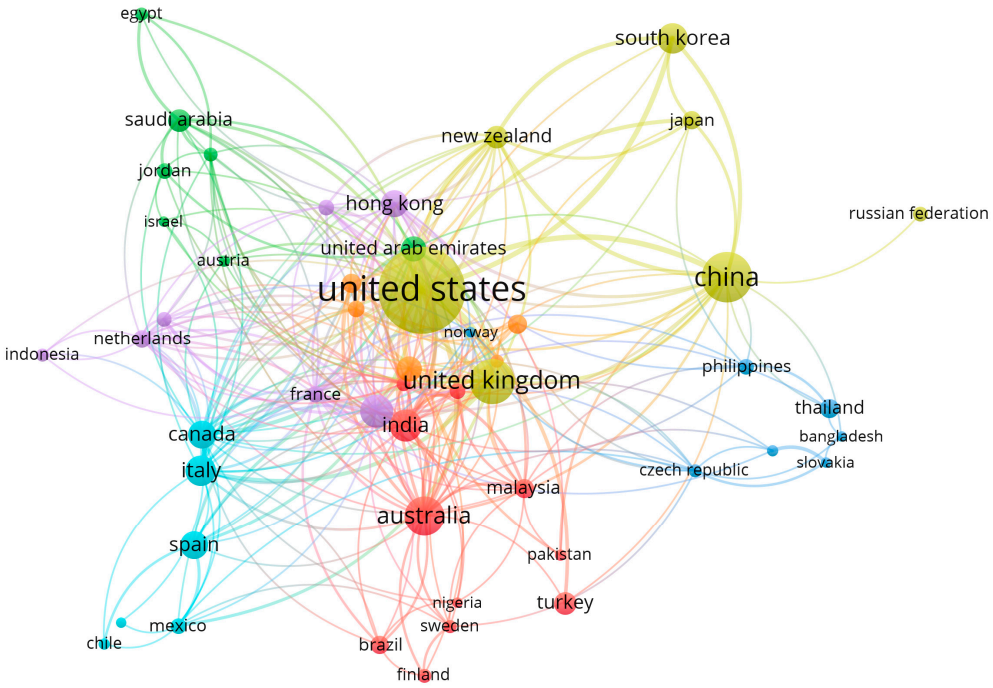

Figure 4. Map of cooperation between authors from different countries/regions.

To generate a network of links between authors from different countries, a limitation of min. 5 publications (per country) was employed. After this restriction, 50 countries were obtained. Looking at the map above, it can be noted that cooperation between authors from different countries and regions is divided into seven main clusters. The largest group is the red cluster, which includes Turkey, Australia and India, among others. In terms of the total number of publications written in international collaboration, the largest cluster is the one in gold, with countries such as the United States, China and the United Kingdom.

3.3. Analysis of Keywords

VOSviewer is able to generate a map based on various indicators, such as the number of occurrences of a given keyword, which significantly affects the understanding of thematic concentrations in the studied literature [60]. This map is shown in Figure 5.

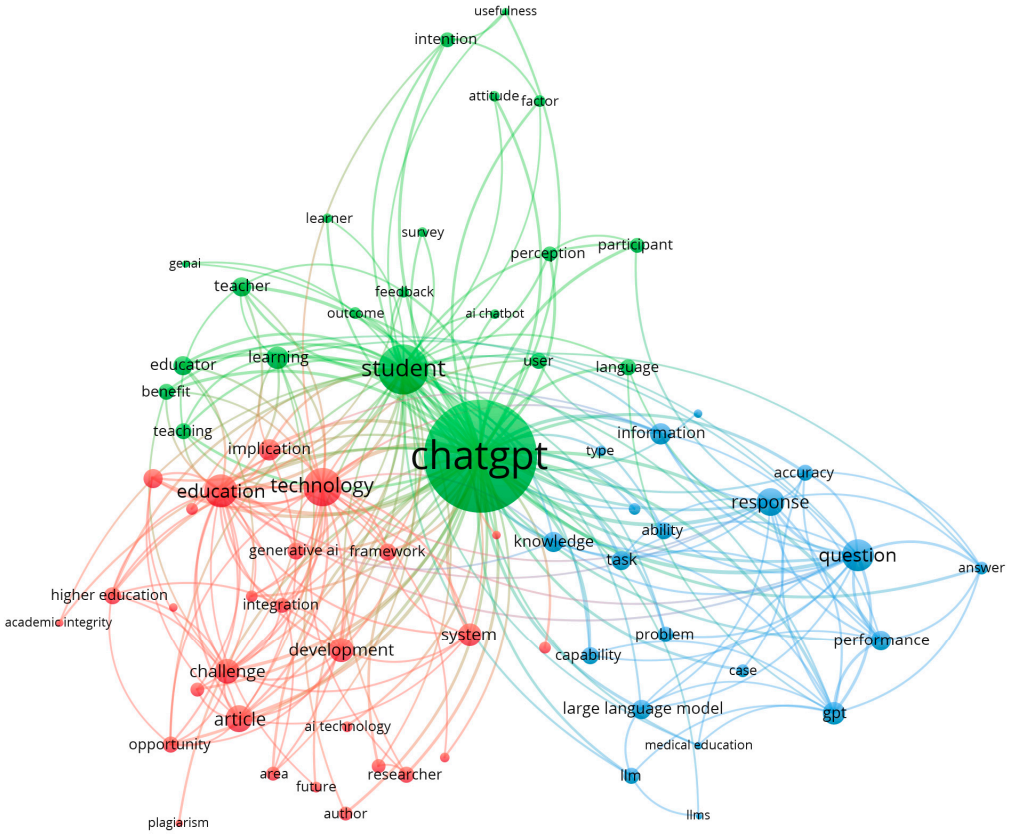

Figure 5. Keywords in selected scientific papers.

During this analysis, 14,745 available terms were identified (terms were extracted from the abstracts). In order to better present the results, the minimum number of occurrences of a term was set at 40, resulting in 115 keywords. After selection based on frequency of occurrence and contextual relationships (a process that involves analysing how terms are related to each other within the context of their use and to other terms to determine their validity and relevance to the entire set of publications), 69 terms were finally selected, representing about 60% of the predefined pool of terms to be selected. The developers of the VOSviewer tool recommend using this proportion to achieve an optimal map structure, allowing for both a full understanding of the dominant topics and the identification of subtle links between them.

The map visualises the frequency of occurrence of specific phrases, represented as nodes of different sizes. The illustrated results indicate the frequency with which keywords appear in close proximity, which has a significant impact on the construction of textual clusters [61]. This method of analysing publications can help to identify the topics that are

most frequently addressed in the literature. Among the most common words are "chatgpt", "student", "technology", "education", "response" and "question".

Once the keyword frequency analysis has been completed and interpreted, the next step is to apply keyword co-occurrence analysis (Figure 6). This method is used to explore the relationships between key terms in the scientific literature in detail. The VOSviewer program makes it possible to identify links between different terms by analysing their interrelationships in the context of the entire dataset. This way, it is possible to better understand which issues are correlated and which research areas are dominant in a given context.

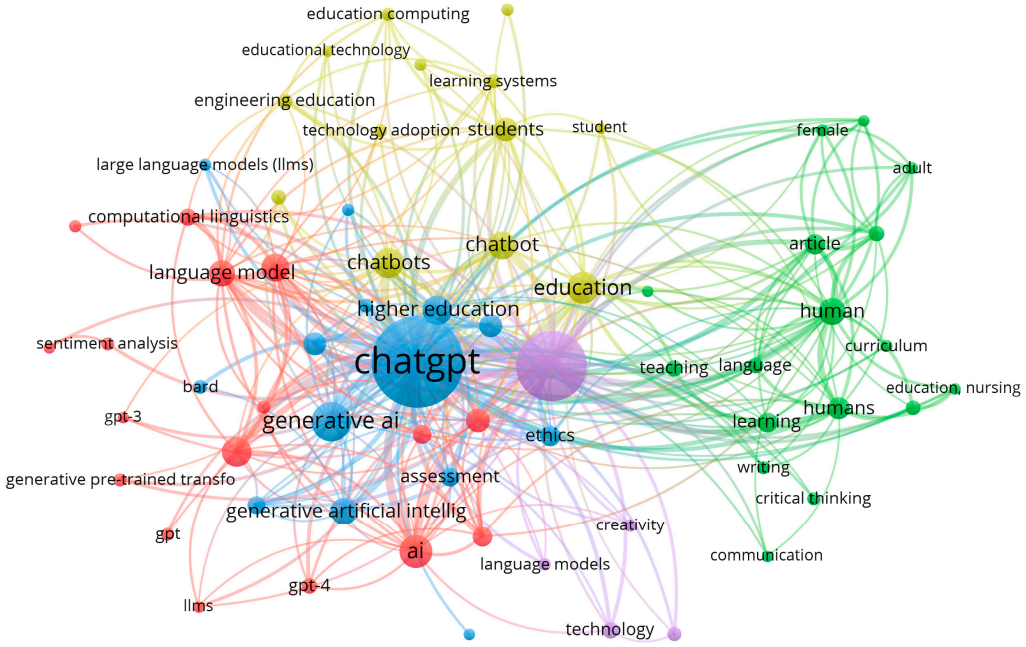

Figure 6. Map of co-occurrence of keywords in selected scientific publications.

The map generated takes into account the limitation related to the minimum number of occurrences of a keyword of eight. As a result, 66 results were included in the map. The highest density was identified in the cluster marked in red and green, which contains 17 keywords each. The red cluster is dominated by terms such as "ai", "large language model", "large language models" and "natural language processing". The green cluster includes keywords such as "human", "humans", "language", "article", "learning" and "teaching". Based on this data, it can be concluded that there is a strong concentration of research in the academic literature reviewed on the use of ChatGPT and AI in the context of human–artificial intelligence relationships.

4. Discussion

This section conducts a more in-depth analysis of the results obtained. The analysed results were interpreted, and the main relationships derived from the acquired data were indicated. This section was divided into three main categories that relate directly to the different types of results that were obtained, i.e., citations and co-citations, source of articles and keywords and the co-occurrence of keywords.

4.1. Citations and Co-Citations

The analysis of citations of publications helps to identify standout thematic areas that inspire further research [62]. In practice, a high number of citations suggests that a scientific paper or its specific thematic area has had a significant impact on the development of the discipline, which is often interpreted as an indicator of its quality and importance. Therefore, citation analysis can serve as inspiration for researchers to conduct further studies in particular areas that seem to be the most promising and current.

The map of authors of the most frequently cited publications provides crucial information about scientific articles that have exceeded the average number of citations, which is equivalent to a higher-than-average impact of these works on the development of the discipline. An above-average number of citations may indicate a significant contribution of these publications to research on the application of ChatGPT in the social sciences. It should be noted that 19.66% of the 814 articles have been cited more often than the average number of citations among all publications (the average citation value, when rounded to whole numbers, is approximately seven), indicating a concentration of scientific interest in specific subject areas or around specific researchers. Moreover, the ten most frequently cited publications account for 35.63% of all citations, suggesting that these works may have a decisive influence on the direction and quality of scientific discussion.

Citation analysis in scholarly publications has shown that a significant portion of academic discourse focuses on the application of ChatGPT in higher education, suggesting that this is a key area of interest for researchers. Moreover, ethical and legal issues occupy an important place in the discussion, reflecting a growing awareness of the need for regulation in the field of artificial intelligence. The high number of citations in these areas may indicate the existence of a significant body of research, which forms the basis for further analysis and innovation. Ultimately, these results can serve as an indicator of research priorities and areas requiring further attention, both in the academic and practical context. Less attention has been given to aspects of security and privacy, which may indicate a gap in research and the need for further development in this direction.

A co-citation map, generated using VOSviewer (Figure 2), reveals the main clusters of authors who have contributed to the development of scholarly discussion on ChatGPT. This indicates the existence of both closely connected scientific communities and a diversity of research approaches. The highest density was identified in the clusters marked in red and green, which contained 25 results each. These clusters can be interpreted as the areas with the greatest impact and significance in relation to the researched issue.

4.2. Source of Articles

The analysis of publication sources provided several important insights. Based on the data from Figure 3, it is observable that some journals have a large number of publications in the analysed area (large nodes), but their works are not often cited (nodes in darker colours). This is the case for *JMIR Medical* Education or *Education and Information Technologies*. This means that although these journals are active in publishing on the topic of ChatGPT in social sciences, their impact measured by the number of citations is relatively low. This may suggest that these publications introduce new concepts or research that has not yet gained broader recognition. Alternatively, it could mean they deal with niche aspects of the topic that have not been thoroughly investigated or are less relevant to the mainstream academic discussion.

On the other hand, journals with smaller nodes but in lighter colours, such as *International Journal of Information Management*, may have fewer publications but with a higher scientific impact. This indicates that their content is much more frequently cited in other works. This attests to their significant contribution to the development and shaping of the scientific discourse on the application of ChatGPT in social sciences.

A bibliometric analysis of articles from specialised journals in the context of ChatGPT applications in the social sciences reflects a nuanced understanding of the role of artificial intelligence in education and ethics. The dominance of the United States in the number of publications is in line with global research trends on the topic, signalling a central hub for AI research and discussion, according to the findings of Khosravi et al. [11]. Similar patterns of regional research leadership and collaboration are evident across disciplines, including medical research, with Barrington et al. highlighting the dominance of the United States in ChatGPT medical publications [13]. The review by Baber et al. further confirms the intense research activity in the United States, while acknowledging the significant contributions of other regions such as China and India [12].

These patterns may indicate a robust AI research infrastructure and a high level of interdisciplinary discourse, fostering progress and a comprehensive approach to the ethical, legal and educational implications of AI technologies such as ChatGPT. The collaborative map suggests that while a concentration of research in certain regions is present, there is a dynamic exchange of knowledge across borders, potentially enriching the global understanding of the social impact of artificial intelligence.

4.3. Keywords and Co-Occurrence of Keywords

The identification and analysis of keywords, which form part of the metastructure of scientific publications, play an important role in bibliometric analysis. These words function as important indicators of the research and theoretical content of a paper and constitute one of the main categorisation tools in databases and scientific repositories [60]. Focusing on keyword analysis from selected publications allows not only for the mapping of dominant research themes and problems but also for the identification of the evolution of paradigms and methodologies within studies on ChatGPT applications in the field of social science [61].

The bibliometric analysis conducted reflects the strong global engagement with ChatGPT across academic disciplines, highlighting its interdisciplinary impact. The prevalence of keywords related to higher education, research and artificial intelligence suggests a collective academic effort to navigate the implications of artificial intelligence in education and scientific research. Keywords such as "human", "question", "answer", "ai" may indicate researchers' interest in the theme of relationships between humans and AI, as well as the methods by which people utilise technology based on artificial intelligence. These patterns are consistent with global trends indicating a leading role for the United States in artificial intelligence research, as confirmed by research by other authors [11,12]. Moreover, the emergence of new research clusters in various databases indicates evolving interests and potential new research directions, especially in natural language processing and its applications in various sectors, including healthcare and education. These insights underscore the dynamism of AI research and its ability to adapt and integrate with many aspects of scientific research, encouraging a continuous and nuanced approach to understanding its development trajectory.

5. Conclusions

Given the context of the rapidly growing field of research on the application of the ChatGPT tool in the social sciences, this article is an important contribution to the bibliometric analysis of this phenomenon. Observations of collaborations between authors from different countries highlight the dominance of the United States in AI research, in addition to significant contributions from other regions, reflecting the global interest and interdisciplinary nature of this field. In addition to mapping the existing state of knowledge, this study conducted points to potential directions for future research. In this regard, there is a need for further theoretical research that can provide a deeper understanding of the impact mechanisms of the ChatGPT tool in the social sciences. In addition, the social aspects associated with the implementation and use of this technology, including issues related to privacy and data security, cannot be overlooked.

This study highlights the thematic diversity of the articles, including ethical, technological and sociological aspects related to the implementation and use of ChatGPT. This indicates the need for an interdisciplinary approach to studying this phenomenon. It is recommended that future researchers pay attention to the ethical and social implications of using ChatGPT, which can contribute to the sustainable and responsible development of this technology. This study has the potential to promote interdisciplinarity, demonstrating the potential for collaboration and knowledge exchange between different scientific disciplines. This study identified gaps and proposed directions for future research, especially in under-researched areas such as the socio-legal impact of AI, advocating for a multidisciplinary approach.

This paper comes with certain limitations. One of these is the thematic scope of the research, covering only the field of social science. There are numerous papers from other disciplines in the Scopus database itself, e.g., on the use of ChatGPT in medicine and healthcare. The possibility of employing this tool in healthcare management is another important research topic. Also, the ChatGPT tool itself presents yet another limitation. GPT, or Generative Pre-trained Transformer, is just one possibility for the use of AI. There are other applications or entire systems that are based on artificial intelligence and machine learning, e.g., XLNet, RoBERTa, BERT and Focus AI. DALL-E, the other product of OpenAI, i.e., the creator of ChatGPT, is also worth paying attention to. It is an interesting tool that turns words into images. Perhaps in the future, it will become an equally important application used, for instance, in preschool education.

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