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BIBLIOMETRIC ANALYSIS OF STUDIES ON CHAT GPT WITH VOSVIEWER

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Abstract: Chat GPT, which suddenly entered our lives at the end of 2022, is a large language model and has attracted the attention of people from all walks of life. Following this, researchers have also conducted studies in many areas related to Chat-GPT in the literature. For this purpose, bibliometric data of different types of works scanned in the Web of Science database and published between 2020-2024 was taken as basis. When we look at the distribution of 415 works related to Chat GPT according to publication years, it is seen that the most were produced in 2024 (222 works), 2023 (186 works) and in each of other years (2 works). It is seen that there has been a concentration in the last two years; the authors who produced the most works are Viroj Wiwanitkit, and Wisit Cheungpasitporn and Jerome R. Lechien; The publication type is mainly journal article (286), paper (48), early appearance (45), review article (30) and letter(6); When the top five research fields are examined, it is found that works are published in the fields of computer science (101), general medicine (50), educational research (32), and surgery (26); the leadership in the distribution of publications by country is with publishers from the USA (123), China (47), and India (33); works are published primarily in English (405), Spanish (6), and Portuguese (3); and publications scanned in SCI-E (227), ESCI (115), and SSCI (45) indexes predominate. When the most frequently used keywords in publications related to Chat GPT are examined, the following are the leading expressions: "artificial intelligence" with 101 occurrences, "Chat gpt" with 90 occurrences, "large language models" with 43 occurrences, "chat gpt" with 42 occurrences, "ai" with 29 occurrences, "chat-gpt" with 27 occurrences, and "chatbot" with 17 occurrences.

Keywords: Chat GPT, Artificial Intelligence, AI, LLM, Chatbot

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1. Introduction

Chat GPT is a generative artificial intelligence tool from the large language model family developed by OpenAI. Generative artificial intelligence is a complex artificial intelligence system that can understand, produce and transform human language thanks to advanced machine learning techniques such as deep learning and neural networks (Bulut, 2024). Using the generative artificial intelligence model; texts can be produced as if they were produced by humans. Not only text production; but also, digital content production including visuals, audio, coding and natural language can be carried out using AI models (Cao et al., 2023).

Table 1 shows the versions and pricing of Chat GPT from the time it was popular to the present day. While GPT-3.5 has 175 billion parameters, GPT-4 is said to have 1.7 trillion parameters. Parameters are settings that allow fine-tuning of the content in AI responses, including tone, style, and creativity. GPT 3.5 can process up to 3,000 words, Chat GPT-4 can process up to 25,000 words, and GPT-4 Turbo can process up to 96,000 words (Meer, 2024). Chat GPT Plus, offered for a monthly subscription fee of $ 20, provides its users with additional benefits such as priority access and internet search (Bulut, 2023).

On May 14, 2024, a completely new version, GPT-4o, was introduced and it was mentioned that it was equipped with more human features (Bulut, 2024). It is currently available free of charge for limited use.

The free version of Chat GPT is GPT-3.5, and the paid version, Chat GPT Plus, is based on GPT-4 technology. It is known that the data for both versions of the training dataset was received until September 2021. This can sometimes cause difficulties in achieving the desired results. In general, it is stated by the authorities that the Plus version is ten times better than the GPT 3.5 version. However, due to its free nature, 30% of Chat GPT users still prefer GPT-3.5 (Subham, 2024).

According to the latest data, Chat GPT has 100 million weekly active users and over 180.5 million monthly users as of August 2024. Daily traffic to Chat GPT has exceeded 100 million visits after the announcement of GPT-4o. It took only 5 days for Chat GPT to add 1 million users after its launch. Based on this active data, using Chat GPT versions in studies seems like an inevitable result (Meer, 2024).

Table 1. GPT versions and release dates (created by the author)

Version Name	Release Date	Fee
GPT 3.5	November 30, 2022	Free
GPT-4	March 13, 2023	Paid
GPT-4 Turbo	November 6, 2023	Paid
GPT-4o	May 13, 2024	Paid/Limited use
GPT-4o mini	July 18, 2024	Paid/Limited use

1.2. Literature Review

Bibliometric analysis on Chat GPT has been studied by many people and in different fields in 2024. The fact that it is a popular topic, and people are working on it means that more publications will be produced on Chat GPT.

Baber et al., in their 2024 study, examined in depth 34 of the 328 publications retrieved from the Scopus database. They stated that GPT studies were in the early stages since the data for this study was retrieved in 2023; they said that applications such as natural language processing and understanding, dialogue systems, speech processing and recognition, learning systems, chatbots and response generation were emphasized. The USA is at the forefront in publishing and new keywords on this subject. The emerging themes are: "patient care", "medical", "higher education" (Baber et al., 2024).

Tian et al. (2023) conducted a bibliometric analysis on ChatGPT through Web of Science in 2023. In this study, a total of 206 articles were examined between 2020 and 2023. The keyword analysis found that chatbot was the main keyword. It revealed that national collaborations were made in America, China and Australia (Tian et al., 2023).

Kurnianingrum et al. conducted an analysis using the Scopus database in their 2024 study. Data were extracted in ChatGPT and English. In the first stage, topic analysis LDA (Latent Dirichlet Allocation) was used for the dataset of publications with related topics to understand the structure of citations and publications. Then, bibliometric analysis was performed using VOSviewer software. Of the 55 articles obtained, 49 were published in journals, and the remaining 6 were published in seminar proceedings. All of these articles were published in 2023 and have a total of 169 citations. "Artificial Intelligence" is the most repeated keyword, followed by "ChatGPT", "human" and "people" (Kurnianingrum et al., 2024).

In their study in 2024, Safdar et al. conducted bibliometric analysis using the Scopus database using applications such as Biblioshiny, VOSviever, Python, MS Access and Excel and Endnote. It was determined that European countries such as the USA, England and Germany led the way, but the USA ranked first with 90 publications and 1,720 citations in this context (Safdar et al., 2024).

García-Carreño conducted an analysis of studies conducted on ChatGPT in social sciences in 2024. Focus was placed on 220 articles out of 828 from the Scopus database. Analysis was conducted with Voswiever.

References were transferred to Mendeley and Prisma was used for meta-analysis. While there were 217 studies in 2023, this number decreased to 3 in 2024. He reported that the most studies were conducted in the USA (57), England (23) and Australia (17). He said that the keywords were "Chat GPT", "ai" and "chatbot" (Carreño, 2024).

Oliński focused on 814 articles from the Scopus database for studies in social sciences in 2024. As a result of the analysis made with VOSviewer; it is seen that the USA, China and England are the countries with the most publications, and when the keywords are examined, the words "Chat GPT", "student" and "technology" stand out (Oliński et al, 2024).

Apart from these studies, there are also studies on ChatGPT in different fields: Khosravi et al. (2024) on Chatbot and GPT topics; Barrington et al. (2023) in medical studies; Zheltukhina et al. (2024); Liu et al. (2024); Samala, et al. (2024); Polat et al. (2024) in education; Khan et al. (2024) in multi-disciplines; Farhat et al. (2024) conducted bibliometric studies investigating the early footprints of Chat GPT.

2. Materials and Methods

In the study, bibliometric analysis was conducted with information extracted from the WOS database on the topic of "Chat GPT". Bibliometric analysis is a tool used for mapping and evaluating scientific knowledge. This method collects data from publications such as scientific journals, articles, and citations, and then analyzes the data to find relevant patterns (Nandiyanto et al., 2021; Kazak and Kazak, 2023; Kumar et al., 2024; Nandiyanto et al. 2024; Buele and Guerra, 2021). Many studies have been conducted in the field of computer science using VOSviewer (Gandasari et al., 2024; Kumar et al., 2024; Ninova and Ninov, 2024; Ria, 2024; Darmawan et al., 2024; Li, 2024; Khong et al., 2024; Fahrudin,2024; Kumari et al., 2024).

The latest version of the VOSviewer program, version 1.6.20, was used for the analysis. Search results in the WOS database can be easily transferred to the VOSviever software via the interface. The information retrieved from the WOS page was downloaded to the computer in txt format. The transferred format includes the publication year, language, journal, title, author, organization, keywords, document type, abstract and number of citations. This information was accessed on September 3, 2024, the date of the analysis.

In the light of the information obtained from the query

made in the WOS database with the keyword Chat GPT, answers to the following questions were sought:

RQ1. What are the basic information and number of the publications on ChatGPT?

RQ2. Who are the authors who conducted Co-Author Analysis on ChatGPT?

RQ3: How is the Citation Analysis of Authors publishing on Chat GPT?

RQ4: What is the Citation Analysis of Countries publishing on Chat GPT?

RQ5: How is the Citation Analysis of Countries that publish on Chat GPT?

RQ6: How is the Citation Analysis of Institutions that publish on Chat GPT?

RQ7: How is the Keyword Analysis of publications on Chat GPT?

RQ8: How is the Bibliographic Matching Analysis of Texts of publications on Chat GPT?

RQ9: What is the Bibliographic Match Analysis of Authors who published on Chat GPT?

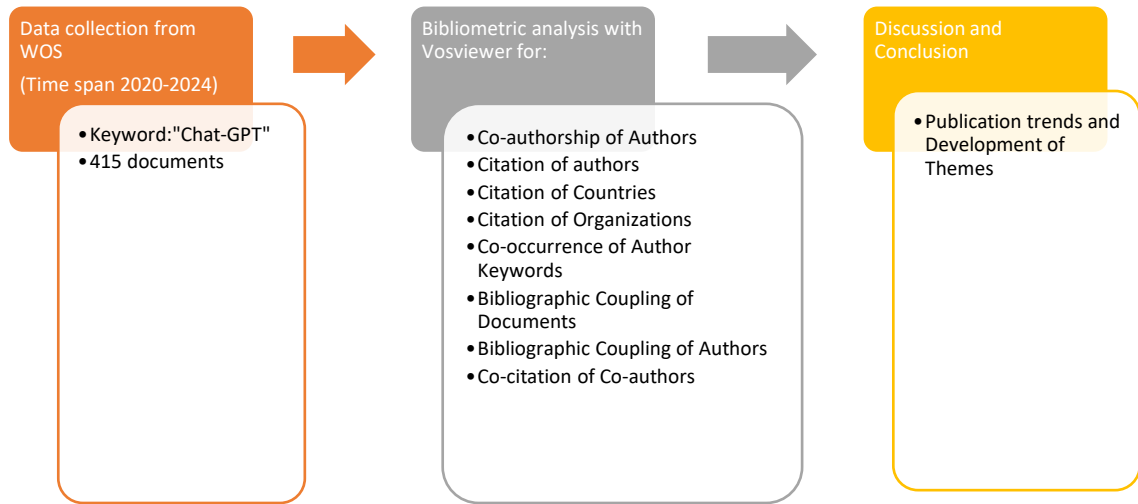RQ10: How is the Co-Citation Analysis of the Authors who published on Chat GPT?

Figure 1. Bibliometric analysis stages.

Figure 1 shows the stages of the bibliometric analysis. In the first stage, data were extracted from the WOS database, in the second stage, it was loaded into the analysis program Vosviever and the previously determined analyses were performed. In the last stage, trends and themes were determined and discussion and conclusion sections were created. Each question is analyzed as a sub-heading.

3. Results

Analyses were made for the previously determined questions and results were obtained.

3.1. Basic Information and number of publications

Some of the basic information obtained because of the query in the WOS database is shown in Figure 2.
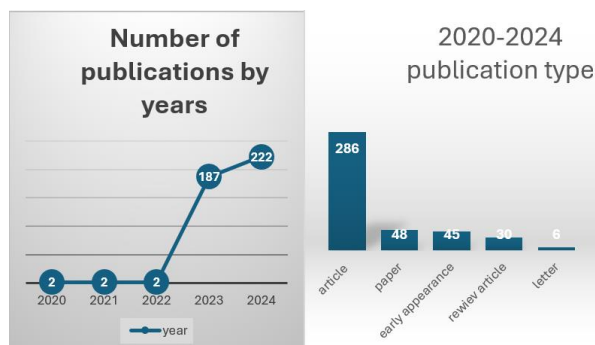
Figure 2. Number and type of publications.

Figure 2 shows the number of publications obtained according to the Chat GPT keyword according to years. Since 2022, the year we started to hear the name of Chat GPT, there has been a sudden increase in the number of publications, which was 187 in 2023, while this number was 222 in the current year. In general, when we look at the types of publications, it was determined that the most common type of publication was articles with 286, papers 48, early views 45 reviews 30 and letters 6. When we look at the types of publications, we see that SCI-E 227, ESCI 115, SSCI 45, Conference proceedings CPCI 21, A&HCI 7. When we look at the first five countries in which authors from which countries have made publications; USA comes with 123 publications, China 47, India 33, Germany 31, Italy 26. There are 13 publications from Türkiye.

When we look at the top five in the subject distribution of the general WOS index, 101 publications in the field of computer sciences, 50 in the field of general medicine, 32 in educational research, 26 in surgery and 25 publications related to the method of computer science theory. From this point of view, we can say that the subjects are generally concentrated in the fields of computer sciences, education and health. When we look at the authors with the most publications, the top five are Wiwanitkit V. 5, Cheungpasitporn W. 5, Lechien, J. R. 4, Thongprayoon, C. 4, Georgakopoulou, V. E. 4. Chat GPT, identified as an author, also has 2 publications. Öztürk A., a Turkish author, also has 2 publications.

3.2. Co-authorship of Authors

By setting a minimum criterion of one publication and one citation, a network map was constructed to identify the authors with the most significant connections and collaborative efforts. The analysis revealed that 17 authors, identified as the most interconnected, were grouped into a single cluster, with a total of 136 connections observed.

As depicted in Figure 3, the author with the highest number of connections within the clusters is Lechien J., who has 4 publications and 52 citations. Following him are M. Mayo-Yanez with 3 publications and 44 citations, and A. Maniaci with 3 publications and 13 citations. The most frequently cited authors include Biswas Som with 257 citations and six others, each with 163 citations

3.3. Citation Analysis of Authors

A network map for author citation analysis was constructed using criteria of at least one publication and one citation, with the aim of identifying citation networks. The analysis of 241 interconnected units revealed a total of 13 clusters, 1,367 connections, and an overall connection strength of 1,492.

As shown in Figure 4, Biswas S. has the highest degree of linkage, with 2 publications and 257 citations. He is followed by Lechien J., who has 4 publications and 52 citations, and Cammarato G., who has 3 publications and 51 citations.

3.4. Citation Analysis of Countries

A network map was generated to analyze the citations received by publications based on their countries of origin. This analysis focused on 50 interconnected observation units, using the criteria of at least one publication and one citation per country. The results identified 9 clusters, 251 connections, and a total connection strength of 392.

As depicted in Figure 5, the countries with the highest citation counts are the USA (958 citations), China (431 citations), and Australia (357 citations). These countries also rank in the top three in terms of total link strength. Regarding the number of publications, the USA leads with 123, followed by China with 47, and India with 33.

3.5. Citation Analysis of Organizations

A network map of inter-institutional citations was created by analyzing 164 interconnected observation units, based on the criterion of at least one publication and one citation per institution.
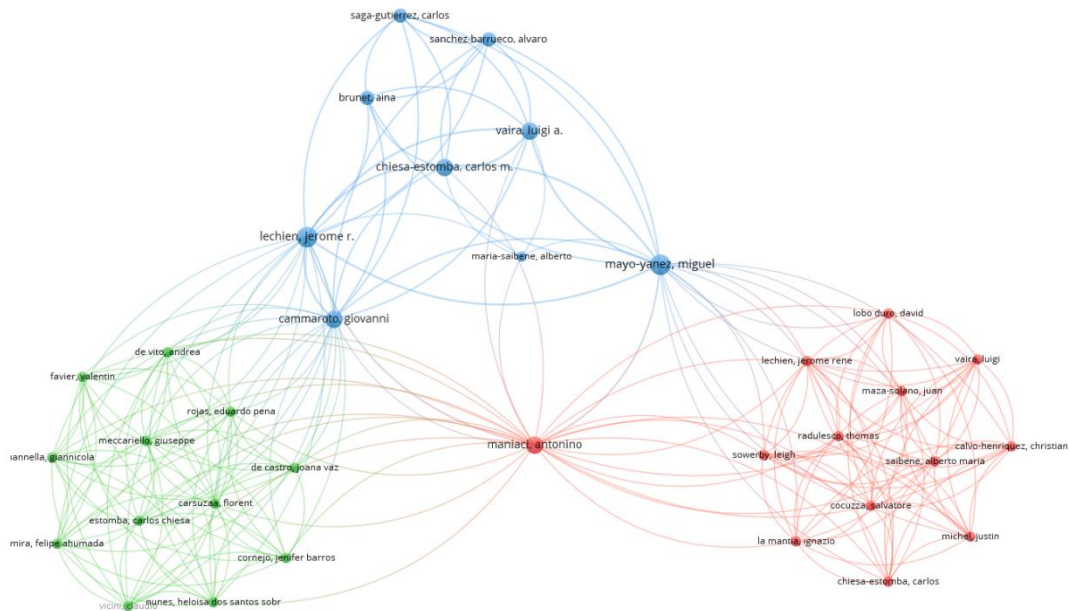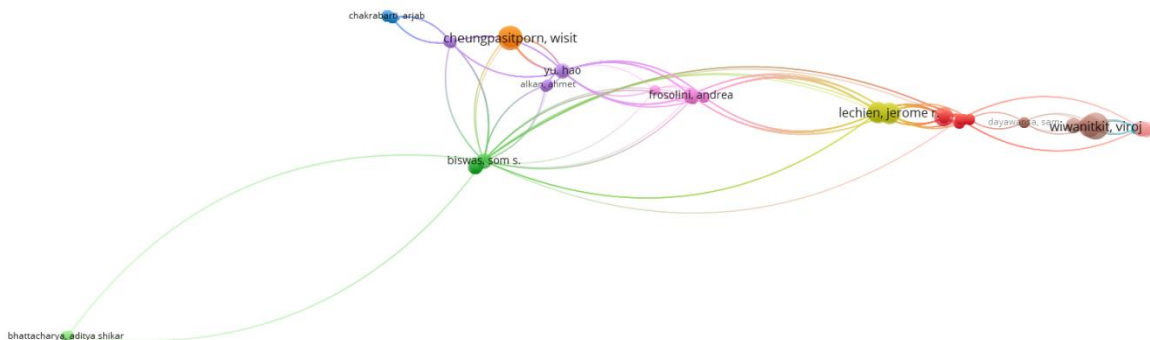

Figure 3. Co-authorship of authors.

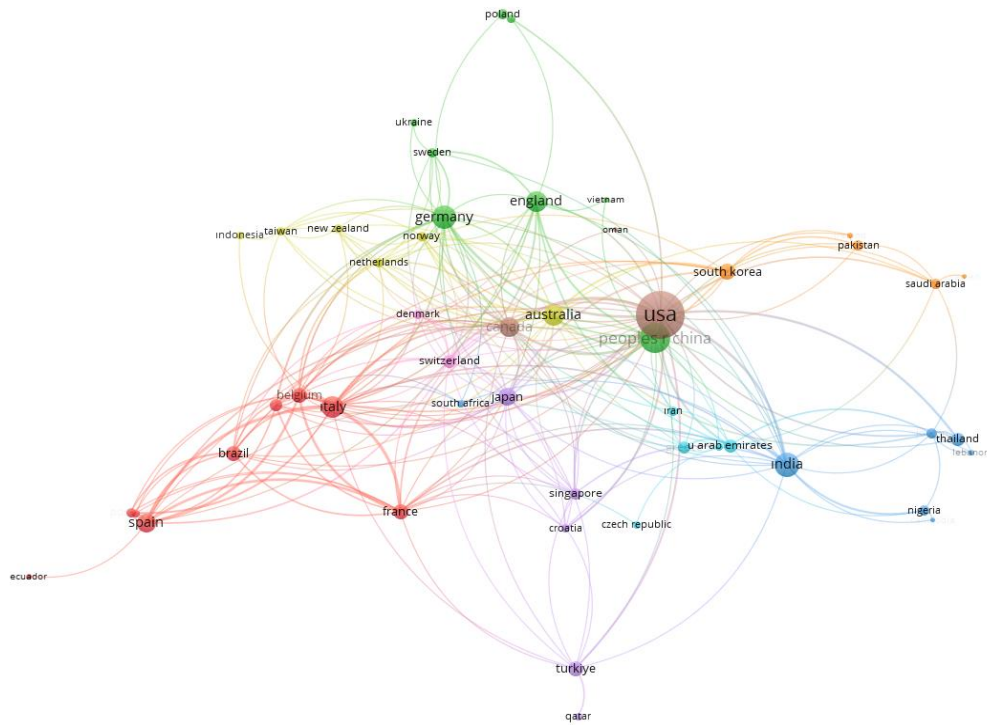**Figure 4.** Citation analysis of authors.

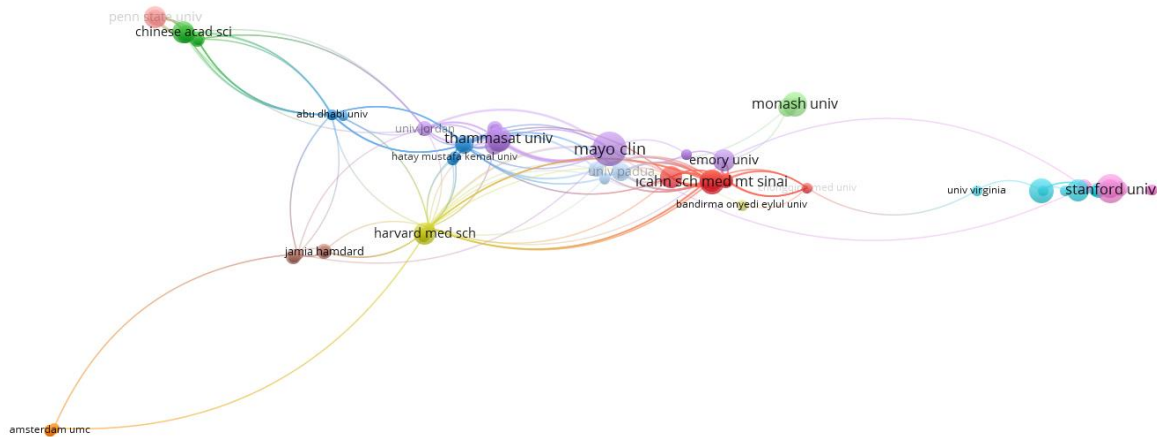**Figure 5.** Citation analysis of countries.

Figure 6. Citation analysis of organizations.

As illustrated in Figure 6, Mayo Clinic (10 publications), Stanford University (7 publications), and Thammasat University (5 publications) are among the most represented institutions by the number of works. The institutions with the most cited publications are the University of Tennessee (182 citations), Chinese Academy of Sciences (170 citations), and Chinese Academy of Sciences University (165 citations). The analysis revealed 13 clusters, 703 connections, and a total connection strength of 746.

3.5. Keyword Analysis (Co-occurence of Author Keywords)

An analysis of 69 observation units, each appearing at least three times and demonstrating interconnections, identified 9 clusters, 520 connections, and a total connection strength of 999.

As illustrated in Figure 7, in publications related to ChatGPT, the most frequently used keywords include 'artificial intelligence,' leading with 101 occurrences, followed by 'ChatGPT' with 90 occurrences, 'large language models' with 43 occurrences, 'chat gpt' with 42 occurrences, and 'AI' with 29 occurrences. The phrases with the highest total connection strength were 'ChatGPT,' 'artificial intelligence,' 'large language models,' 'chatbot,' and 'chat-gpt'.

Figure 7. Keyword analysis (Co-occurence of author keywords).

An important point that draws attention is that since a standard spelling is not preferred for the words chat gpt and chat gpt, these two keywords have produced results as if they were different words. There is even a keyword in the form of Gptchat. However, the words are the same even if they are written differently. In fact, with 132 repetitions, which is the sum of the two words, it repeated more than the keyword artificial intelligence.

3.6. Bibliographic Coupling Analysis of Documents
Bibliographic matching occurs when two independent sources cite a common work. An analysis of 171 works, selected based on the criteria of having at least one citation and an interconnection, identified 11 clusters, 2,280 connections, and a total connection strength of 3,435.

Figure 8. Bibliographic coupling analysis of documents.

As shown in Figure 8, the publications with the highest number of bibliographic matches are Biswas (2023a) with 182 citations, Wu (2023) with 163 citations, and Kocon (2023) with 108 citations. The works with the highest total link strength are Sohail (2023), Jefferson (2018), and Watters (2023).

3.7. Bibliographic Coupling Analysis of Authors

Using the criterion of having at least one published work, one citation, and an interconnection, an analysis was conducted on 871 units. The results revealed 21 clusters, 76,092 connections, and a total connection strength of 240,447."
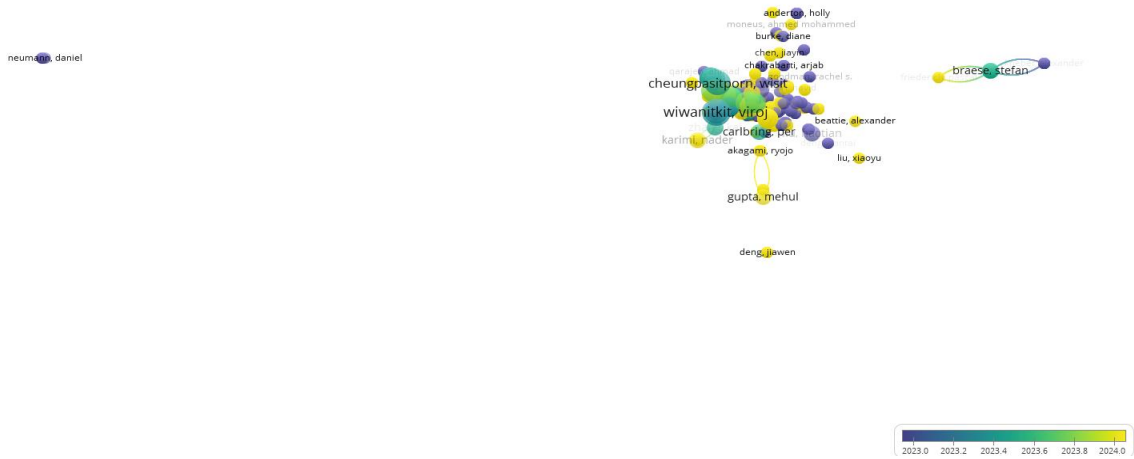
**Figure 9.** Bibliographic coupling analysis of authors.

As depicted in Figure 9, the authors with the highest number of bibliographic matches are Som S. Biswas with 257 citations (0 link strength), Qing-Long Han with 163 citations (1,814 link strength), and He Shizhu with 163 citations (1,814 link strength).

3.8. Co-citation of Co-authors

Co-citations refer to different sources cited together in a publication. An analysis was conducted on 45 units, selected with a minimum of 10 citations. The analysis identified 5 clusters, 570 connections, and a total connection strength of 2,165.

As shown in Figure 10, the most commonly cited authors were OpenAI (86 citations), Tiffany Kung (33 citations), and B. Brown (30 citations).
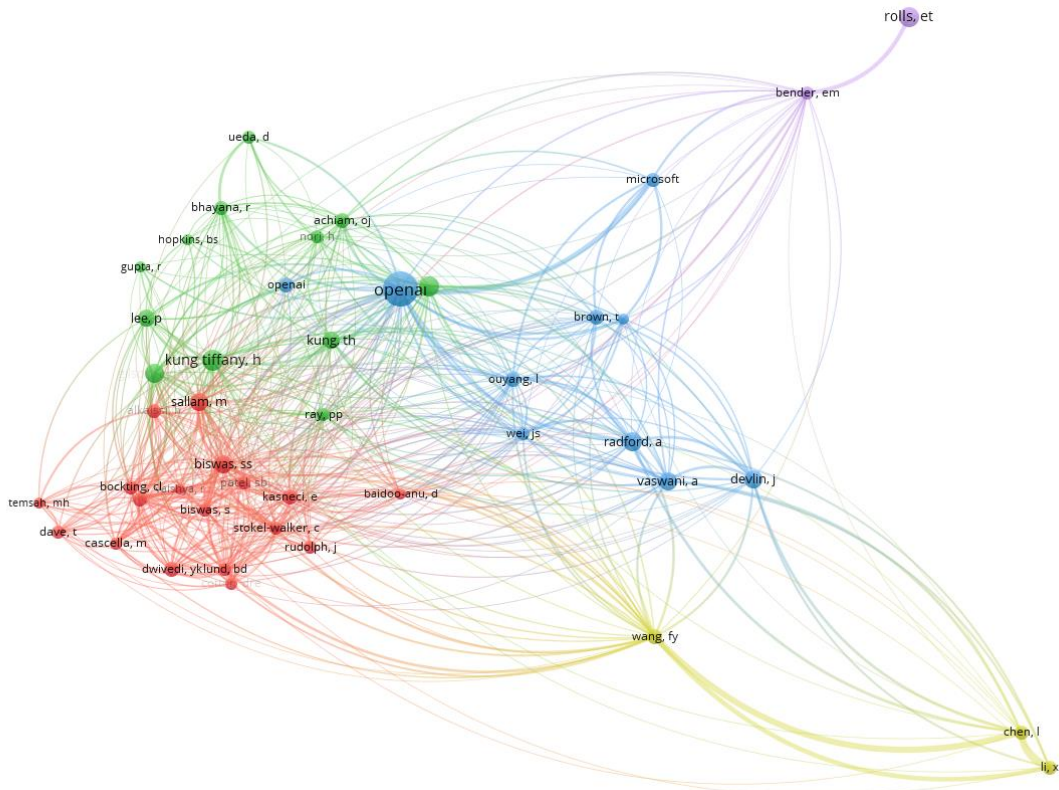
Figure 10. Co-citation analysis of co-authors.

4. Discussion and Conclusion

The publications related to Chat GPT were taken from the WOS database and the data were analyzed objectively and comprehensively. The research conducted consists almost entirely of articles published in English. The small number of articles written in other languages and the small total sample size prevented the use of language restrictions. It is inevitable that most of the publications are in the fields of artificial intelligence, information systems and multidisciplinary applications in computer science. It also shows that Chat GPT is used in the fields of medicine and education.

416 publications about Chat GPT indexed in the WOS database were included in the analysis. It was determined that the most frequently used keywords were "artificial intelligence" and "Chat gpt". When looking at other keywords, it was observed that there were new combinations of the word Chat GPT written with different notations. A single usage type was not adopted, and authors used different methods when writing keywords. When we examine the keywords in the Keyword Analysis, the words 'Google Bard', 'Bingchat' are also seen in some studies. Google Bard is also an LLM model, and its name was changed, now it is Gemini (Rayhan, 2024). Similarly, Bing has changed its name and is called Microsoft Copilot (Microsoft, 2024). In many studies, they are used with Chat GPT for comparison performance in different domains (Rudolph et al, 2023; Afgiansyah, 2023; Dao, 2023; Motlagh et al, 2023; Giannakopoulos et al, 2023; Sallam et al, 2024; Krause, 2023; Makrygiannakis et al, 2024).

When we look at the co-authorship of the authors; If we take the release year of Chat GPT as 2022, it is a subject of about 2 years, so the authors mentioned do not have many publications. When we look at the distributions based on years, the number was 2 in 2022, 186 in 2023 and 222 in 2024. However, since this topic is open-ended and can be used in connection with every field, there is no doubt that the numbers will increase. It is seen that America is both the most cited and the most published country. China comes next.

Another important point is that when we look at the authors, we see that the most cited author is Openai. This shows that researchers get information from Openai as a primary source with Chat GPT. At the same time, Chat GPT is now shown as the author in the studies. It can be labeled as a co-author or a partial author. It can be given as an author in the sources section as "OpenAI. (2021). ChatGPT (Version 3.5) [Software]. Retrieved from https://openai.com/". In the authors section, GPT C. and 'Artificial Intelligence, OpenAI, San Francisco, CA USA' can be given as author addresses. As an example of author attribution, there are two studies in this analysis in which Chat GPT was added as an author (Matusov et al, 2023; Sampath et al, 2023). However, no one is responsible for the accuracy of the content produced by Chat GPT. It is left entirely to the user to investigate the accuracy of the content produced here. In fact, Chat GPT now warns "ChatGPT may make mistakes. Check important information." warning message.

When we analyse the keywords given by the authors in more detail; the word 'ethics' also draws attention. Ethics is one of the biggest problems when it comes to Chat GPT. For example, with the increasing number of people using Chat GPT to create original-like text content without citation, the copyright of the content created by ChatGPT is becoming a serious concern (Wu et al., 2024). In addition, the use of Chat GPT brings ethical issues such as potential security, confidentiality, toxicity, bias and plagiarism. (Hua et al., 2024). Nevertheless, there are some guidelines for researchers to benefit from Chat GPT in their publications. In our country, the Council of Higher Education has published a guide describing how artificial intelligence can be used in publications (YÖK, 2024). A Guide to Productive Artificial Intelligence has been prepared by UNESCO to show how it can be used in Education and Research in line with the 2030 Sustainable development goals (Unesco, 2024). There is another guide published by the European Union Commission for the responsible use of productive artificial intelligence in research (European Commission, 2024).

When we look at the limitations of the study; using only the WOS database, not making use of other large databases, the fact that the subject has been actively studied for only 2 years, the authors not using a uniform method in keyword tagging but naming it differently are the first things that come to mind. Publications on Chat GPT have also been made in databases such as Scopus, Google Scholar, Pubmed, IEEE, Researchgate. In the light of the data obtained from these databases in different studies, biometric analysis can be performed with a different tool such as Biblioshiny. Vosviewer tool was used for visualisation; however, tools such as Bib Excel, Publish or Perish, Gephi and HistCite can also be preferred.

When the importance and benefits of Chat GPT in human life are evaluated; to evaluate and guide the studies to be conducted on the subject, a bibliometric analysis was conducted on the articles containing the word "Chat-GPT" in the Web of Science database until September 3, 2024. As a result of the findings of the research, it is important to contribute to the development of the subject by conducting studies in the fields of education, health, user experience for NLP natural language processing in the literature.

Author Contributions

The percentage of the author contributions is presented below. The author reviewed and approved the final version of the manuscript.

	S.B.
C	100
D	100
S	100
DCP	100
DAI	100
L	100
W	100
CR	100
SR	100
PM	100
FA	100

C=Concept, D= design, S= supervision, DCP= data collection and/or processing, DAI= data analysis and/or interpretation, L= literature search, W= writing, CR= critical review, SR= submission and revision, PM= project management, FA= funding acquisition.

Conflict of Interest

The author declared that there is no conflict of interest.

Ethical Consideration

Ethics committee approval was not required for this study because of there was no study on animals or humans.

References

Afgiansyah, A. 2023. Artificial intelligence neutrality: Framing analysis of GPT powered-Bing Chat and Google Bard. J Riset Kom (JURKOM), 6(2): 179-193.

Baber H, Nair K, Gupta R, Gurjar K. 2024. The beginning of ChatGPT–a systematic and bibliometric review of the literature. J Inf Learn Sci, 125(7/8): 587-614.

Barrington NM, Gupta N, Musmar B, Doyle D, Panico N, Godbole, N, Reardon T, D'Amico RS. 2023. A bibliometric analysis of the rise of Chatgpt in medical research. J Med Sci, 11(3): 61.

Buele I, and Guerra T. 2021. Bibliometric analysis of scientific production on tax evasion in science direct, years 2010 to 2019. J Leg Eth Reg Iss, 24: 1.

Bulut S. 2023. Üretken yapay zeka Chatgpt, Bing ve Bard karşılaştırmalı bir inceleme. Int J Adv Nat Sci Eng Res 7(9): 104 – 109.

Bulut S. 2024. Üretken yapay zeka teknolojisi: GPT-4o. 2024. Int J Adv Nat Sci Eng Res, 8(4): 380 – 387.

Cao Y, Li S, Liu Y, Yan Z, Dai Y, Yu PS, Sun L. 2023. A comprehensive survey of ai-generated content (aigc): A history of generative AI from Gan To Chatgpt, ArXiv preprint arXiv:2303.04226, 111:44.

Carreño IDVG. 2024. Chatgpt one year after its launch a bibliometric analysis. In Perspectivas Contemporáneas En Educación: Innovación, Investigación Y Transformación, pp: 1210-1233.

Dao XQ. 2023. Which large language model should you use in Vietnamese education: Chatgpt, Bing Chat, or Bard? Bing Chat, or Bard URL: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4527476 (accessed date: September 24, 2024).

Darmawan BR, Ramadhan MR, Nurmandi A, Fridayani HD, Loilatu MJ. (2024). Systematic review on public services in the implementation of smart city using Vosviewer. J Aristo, 13(1): 1-30.

European Commission. 2024. Living guidelines on the responsible use of generative AI in research. URL: https://research-and-innovation.ec.europa.eu/document/download/2b6cf7e5-36ac-41cb-aab5-0d32050143dc_en?filename=ec_rtd_ai-guidelines.pdf (accessed date: September 20, 2024).

Fahrudin TM. 2024. Bibliometric analysis and literature review of big data research fields using publish or Perish and Vosviewer. Nusantara Sci Technol Proceed, 2024: 250-258.

Farhat F, Silva ES, Hassani H, Madsen DØ, Sohail SS, Himeur Y, Zafar A. 2024. The scholarly footprint of ChatGPT: a bibliometric analysis of the early outbreak phase. J Front Artif Intel, 6: 1270749.

Gandasari D, Tjahjana D, Dwidienawati D, Sugiarto M. 2024. Bibliometric and visualized analysis of social network analysis research on Scopus databases and Vosviewer. J Cog Bus Manag, 11(1): 2376899.

Giannakopoulos K, Kavadella A, Aaqel Salim A, Stamatopoulos V, Kaklamanos EG. 2023. Evaluation of the performance of generative AI large language models Chatgpt, Google Bard, And Microsoft Bing chat in supporting evidence-based dentistry: Comparative mixed methods study. J Med Intern Res, 25: 51580.

Hua S, Jin S, Jiang S. 2024. The limitations and ethical considerations of Chatgpt. J Data Intel, 6(1): 201-239.

Kazak M, Kazak G. 2023. Sağlık turizmi alanında yapılan çalışmalarının Vosviewer ile bibliyometrik analizi. J Health Manag Lead, (1): 34-45.

Khan N, Khan Z, Koubaa A, Khan MK, Salleh RB. 2024. Global insights and the impact of generative AI-Chatgpt on multidisciplinary: a systematic review and bibliometric analysis. J Con Sci, 36(1): 2353630.

Khong I, Pangilinan GA, Abelar YJ, Yadav N, Mariano EP. 2024. Mapping cybersecurity literature: insights from Vosviewer analysis. J Ad Tech Innov, 1(1): 35-41.

Khosravi H, Shafie MR, Hajiabadi M, Raihan AS, Ahmed I. 2024. Chatbots and Chatgpt: a bibliometric analysis and systematic review of publications in Web of Science and Scopus databases. Int J Data Min Model Manag, URL: https://arxiv.org/pdf/2304.05436 (acessed date: September 20, 2024).

Krause D. 2023. Large language models and generative ai in finance: an analysis of Chatgpt, Bard, and Bing AI. Bard, and Bing AI. URL: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4511540 (accessed date: September 20, 2024).

Kumar R, Saxena S, Kumar V, Prabha V, Kumar R, Kukreti A. 2024. Service innovation research: a bibliometric analysis using Vosviewer. Competitiveness Review: An Int Bus J, 34(4): 736-760.

Kumari N, Indukuri BR, Ganti P. 2024. Exploring the intersection of entrepreneurship and blockchain technology: a research landscape through R studio and Vosviewer. In Blockchain Transformations: Navigating the Decentralized Protocols Era, Cham: Springer, Nature, Switzerland, pp: 181-196.

Kurnianingrum D, Jumri IAB, Ratnapuri CI, Karmagatri M, Kartawinata BR. 2024. Exploring the Chat GPT's impact and prospects for business research purposes. In 3rd International

Conference for Innovation in Technology (INOCON), March 1-3, Bangalore, India, pp: 1-6.

Li F. 2024. Computer bibliometric analysis of Hakka dialect phonetics based on Citespace and Vosviewer. J Elect Sys, 20(2): 752-760.

Liu J, Wang C, Liu Z, Gao M, Xu Y, Chen J, Cheng Y. 2024. A bibliometric analysis of generative AI in education: current status and development. Asia Pacific J Edu, 44(1): 156-175.

Makrygiannakis MA, Giannakopoulos K, Kaklamanos E G. 2024. Evidence-based potential of generative artificial intelligence large language models in orthodontics: a comparative study of Chatgpt, Google Bard, and Microsoft Bing. Europ J Orth, 46(2): 1-7.

Matusov, E, GPT, C, Smith, MP, Shugurova, O. 2023. Does Chatgpt4 have a dialogical self? a Bakhtinian perspective. J Cult Psyc, 1354067X231219454: 1–30.

Meer DV. 2024. Number of ChatGPT users and key stats. URL: https://www.namepepper.com/chatgpt-users (accessed date: September 3, 2024).

Microsoft. 2024. URL: https://support.microsoft.com/en-us/topic/copilot-in-bing-our-approach-to-responsible-ai-45b5eae8-7466-43e1-ae98-b48f8ff8fd44#:~:text=In%20November%202023%2C%20Microsoft%20renamed,commitment%20to%20responsible%20AI%20seriously. (accessed date: September 10, 2024).

Motlagh NY, Khajavi M, Sharifi A, Ahmadi M. 2023. The impact of artificial intelligence on the evolution of digital education: a comparative study of Openai text generation tools including Chatgpt, Bing Chat, Bard, And Ernie. ArXiv preprint arXiv:2309.02029. URL: https://arxiv.org/pdf/2309.02029 (accessed date: September 3, 2024).

Nandiyanto ABD, Al Husaeni DN, and Al Husaeni DF. 2021. A bibliometric analysis of chemical engineering research using Vosviewer and its correlation with covid-19 pandemic condition. J Eng Sci Tech, 16(6): 4414-4422.

Nandiyanto ABD, Fiandini M, and Al Husaeni DN. 2024. Research trends from the Scopus database using keyword water hyacinth and ecosystem: a bibliometric literature review. Asean J Sci Eng, 4(1): 33-48.

Ninova V, Ninov N. 2024. Inshurtech: bibliometric analysis using Vosviewer. 109th International Scientific Conference on Economic and Social Development - "Green Economy & Sustainable Development", 5-6 April, Dubrovnik, Croatia, pp: 125.

Oliński M, Krukowski K, Sieciński K. 2024. Bibliometric overview of Chatgpt: new perspectives in social sciences. Publications, 12(1): 9.

Polat H, Topuz A, Yıldız M, Taşlıbeyaz E, Kurşun E. 2024. A bibliometric analysis of research on Chatgpt in education. Int J Tech Edu (IJTE), 7(1): 59-85.

Rayhan, S. 2024. The impact of changing the name of google ai from Bard to Gemini. DOI: 10.13140/RG.2.2.30294.83520.

URL: https://www.researchgate.net/publication/378124023_The_Impact_of_Changing_the_Name_of_Google_AI_from_Bard_to_Gemini?channel=doilinkId=65c77d891bed776ae33baed0showFulltext=true (accessed date: September 10, 2024).

Ria RRP. 2024. Computational thinking assessment: bibliometric analysis-Vosviewer. Simki Pedag, 7(1): 305-316.

Rudolph J, Tan S, Tan S. 2023. War of the chatbots: Bard, Bing Chat, Chatgpt, Ernie and beyond. The new ai gold rush and its impact on higher education. J App Learn Teach, 6(1): 364-389.

Safdar M, Siddique N, Gulzar A, Adil S A, Yasin H, Khan MA. 2024. A bibliometric analysis of literature published on Chatgpt and GPT. Global Knowledge, Memory and Communication. URL: https://doi.org/10.1108/GKMC-08-2023-0304 (accessed date: September 10, 2024).

Sallam M, Al-Salahat K, Eid H, Egger J, Puladi B. 2024. Human versus artificial intelligence: Chatgpt-4 outperforming Bing, Bard, Chatgpt-3.5, and humans in clinical chemistry multiple-choice questions. Adv Med Edu Prac, 15: 857-87.

Samala AD, Sokolova EV, Grassini S, Rawas S. 2024. ChatGPT: a bibliometric analysis and visualization of emerging educational trends, challenges, and applications. Inter J Eval Res Edu (IJERE), 13(4): 2374-2387.

Sampath A, Sukumar M, Tejaswini P, Gupta A, Khadanga S. 2023. Acute pneumonia like illness and sepsis in India: is it time to suspect pulmonary melioidosis? Cureus, 15(3): e36122.

Subham S. 2024. ChatGPT Statistics (AUG 2024) – users growth data. URL: https://www.demandsage.com/chatgpt-statistics/ (accessed date: September 3, 2024).

Tian Q, Yi W, Wang PXX, Zhang Y. 2023. Bibliometric analysis of research on Chatgpt: using Vosviewer. In Proceedings of the 2023 6th International Conference on Educational Technology Management, November 3-5, Guangzhou, China, pp: 235-243.

Unesco. 2024. Eğitim ve araştırmada üretken yapay zekâ kılavuzu URL: https://unesdoc.unesco.org/ark:/48223/pf0000390842/PDF/390842tur.pdf.multi (accessed date: September 3, 2024).

Wu X, Duan R, Ni J. 2024. Unveiling security, privacy, and ethical concerns of Chatgpt. J Inf Intelli, 2(2): 102-115.

YÖK. 2024. Yükseköğretim kurumları bilimsel araştırma ve yayın faaliyetlerinde üretken yapay zekâ kullanımına dair etik rehber. URL: https://www.yok.gov.tr/Documents/2024/yapay-zeka-kullanimina-dair-etik-rehber.pdf (accessed date: September 3, 2024).

Zafrullah Z, Hardi VA, Nabilah N, Fitriani A. 2024. Transforming the utilization of Chatgpt in education: a bibliometric analysis. Innovative: J Soc Sci Res, 4(1): 5610-5623.

Zheltukhina MR, Sergeeva OV, Masalimova AR, Budkevich RL, Kosarenko NN, Nesterov GV. 2024. A bibliometric analysis of publications on Chatgpt in education: research patterns and topics. Online J Com Media Tech 14: e202405.