[1]FIRST PUBLICATIONS ABOUT CHATGPT IN THE BRAZILIAN ACADEMIC SPHERE FROM THE PERSPECTIVE OF SOCIAL NETWORK ANALYSIS

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ABSTRACT

Objective: To investigate the profile and dynamics of academic publications on ChatGPT in Brazil using Social Network Analysis (SNA), a methodology that maps relationships among actors such as authors, institutions, journals, and key concepts.

Method: Twenty publications indexed in the SPELL database were analyzed using SNA with UCINET and NetDraw software. The study examined co-authorship, co-citation, institutional, and keyword networks, applying metrics such as network density and betweenness centrality.

Results: The year 2024 emerged as the most central in the timeline. Review of Artificial Intelligence in Education (Publisher Alumni in) was the most influential journal. UNINOVE and FGV-SP were the most central institutions. The most relevant keywords included ChatGPT, artificial intelligence, higher education, chatbot, and education. The most central citations were OpenAI (2023), Rossoni (2022), and Lund & Wang (2023). The networks showed low density, reflecting weak information flow and limited academic interaction.

Conclusion: This pioneering study sheds light on Brazil's academic production on ChatGPT through an original application of SNA. The results provide useful insights for early-stage researchers and support the thematic consolidation and growth of generative AI research in the country.

Keywords: ChatGPT; Artificial intelligence; Scientific publishing; Social Network Analysis; SPELL (ANPAD).

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1 INTRODUCTION

In recent years, the simultaneous advancement of numerous technologies has led to significant progress in Artificial Intelligence (AI). In this context, it is important to highlight that one remarkable development in AI which has generated considerable interest among researchers from various disciplines and the general public was the introduction of ChatGPT in November 2022. Unlike automated text editing tools, such as *Microsoft Word* and *Grammarly*, it was designed to be capable of creating content, reproducing models, and even proposing the construction of academic theories. *ChatGPT* is based on a variant of the *Instruct GPT* model. This model was trained on a vast dataset to efficiently respond to queries. Thus, it uses Natural Language Processing (NLP) to generate responses to text based inputs. In this way, GPT models are built on the *Transformer* architecture, which is a neural network (Farhat, Silva, Hassani, Madsen, Sohail, Himeur, Alam & Zafar, 2023; Oliveira & Neves, 2023; Raman, Lathabhai, Diwakar & Nedungadi, 2023; Carreño, 2025; Koo, 2025).

Given the above, it is important to emphasize that the advent of *ChatGPT* has generated widespread discussion about its use as a language processing model, which has directly impacted its popularity and subsequent global growth. According to statistics provided by *Statista*, *ChatGPT* reached one million users in just five days after its launch. It is also noteworthy that estimates from *Reuters* indicate that *ChatGPT* has the fastest growing user base, reaching 100 million users just two months after its introduction. Additionally, an analysis by the data company *Similarweb* revealed that *ChatGPT* received approximately 590 million visits in january 2023. Given this, the widespread prevalence of *ChatGPT* has led numerous organizations, Higher Education Institutions (HEIs), and consequently, scientific researchers to explore its potential significance and applications (Mubin, Alnajjar, Trabelsi, Ali, Parambil & Zou, 2024).

In the academic sphere, the arrival of *ChatGPT* has triggered a wave of research and exploration into its potential applications across various fields of knowledge, particularly in the areas of health and education. However, up to the present moment, few studies have been found regarding *ChatGPT* within the field of Administration and related areas. In this context, academic investigation into *ChatGPT* is of great importance, as it brings forth the purpose of understanding its impact, applications, and future directions within academia, therefore, metric studies are essential to this end (Farhat *et al*., 2023; Raman *et al*., 2023; Serra, Vasconcelos, Chaves, Lopes & Sousa, 2024; Carreño, 2025; Koo, 2025).

In this regard, it is observed that metric studies especially those employing bibliometrics (Cunha, 2024), have already been published exploring the *ChatGPT* theme within the global academic context (Farhat *et al*., 2023; Raman *et al*., 2023; Farhat *et al*., 2024; Lathabai, Prabhakaran & Raman, 2024; Mubin *et al*., 2024; Oliński, Krukowski & Sieciński, 2024; Carreño, 2025; Koo, 2025), for this purpose, international databases particularly *Web of Science* and *Scopus* have been used. However, no studies focusing on the *ChatGPT* topic within the Brazilian academic literature were found, nor were any studies predominantly centered on Social Network Analysis (SNA). Given this, such observation reveals a research opportunity, leading to the emergence of the guiding research question that structured and grounded this scientific article: What is the profile and dynamics of the *ChatGPT* theme in scientific research published within the brazilian academic sphere from the perspective of (SNA)?

Considering the points previously discussed, the objective of this study was defined as follows: To investigate the profile and dynamics of the *ChatGPT* theme in scientific research published within the brazilian academic context from the perspective of SNA. The use of SNA is justified by its ability to contribute to the generation of findings with better interpretative

potential compared to bibliometric studies, especially through the visual inspection that SNA enables (Sampaio, Sacerdote, Fonseca & Fernandes, 2015). Thus, SNA or sociometry, aims not only to investigate the profile and dynamics but also to understand the structure and formation of academic research, that is, the intellectual scientific production relationships among the actors involved in the process of constructing scientific knowledge across different academic themes (Dias, Silva, França, Souza & Silva, 2018; Urbizagástegui-Alvarado, 2022; Ribeiro, 2023a; Cui & Dong, 2025), as in the case of *ChatGPT*.

In the context of national scientific research, the *Scientific Periodicals Electronic Library* (SPELL), was used its use in this investigation is justified by the fact that it is a database system that indexes academic studies and makes them freely available, particularly in the fields of Public and Business Administration, Accounting, and Tourism. Therefore, SPELL aims to provide access to, organization of, dissemination of, and research on scientific production across various fields of knowledge. In this way, SPELL fulfills a dual mission: (i) to organize, on a single data platform, a significant collection of information and knowledge; and (ii) to provide open access to users interested in academic production on a wide range of scientific topics. It is also worth noting that SPELL is one of the main brazilian databases used by authors in metric studies, such as sociometry (IBEPES, 2024; Ribeiro, 2024a).

Finally, it is important to emphasize that, for the first time and up to the present day, this study brings forth the theme of *ChatGPT*, investigated through research focused on the scientific production of national academic investigations published in scientific journals, based on the SPELL database and primarily under the lens of (SNA). Therefore, the relevance of this academic work is evident, as it is grounded in its originality and, consequently, provides data, information, and knowledge at the state-of-the-art level for the academic community. As a result, this scientific study will contribute to the emergence of further research on the academic production related to the *ChatGPT* theme and to its dissemination within academia, this, in turn, will promote a better understanding and, subsequently, a deeper comprehension of the subject, thereby impacting its growth, development, and maturation within Brazilian scientific literature.

2 CHATGPT

AI technologies have advanced and become increasingly diverse and complex (Liang, Luo, Hu & Li, 2022), this has given rise to what is known as *machine learning*, as well as *deep learning*. In this context, it is stated that the advancement in processing power, combined with machine learning, has triggered a true technological revolution especially with the creation of “Intelligent Virtual Assistants”, such as *chatbots*, which are capable of responding to questions with comprehensive textual answers through the use of advanced NLP systems. Simply put, *chatbots* are computer programs designed to simulate conversations with human users by responding to a series of questions, typically in an appropriate manner. In the 1960s, the first *chatbot*, known as Eliza, was developed at the AI laboratory of the *Massachusetts Institute of Technology* (MIT) (Serra *et al*., 2024).

The rapid advances in AI have led to the development of sophisticated language models capable of understanding and generating human-like text. One notable AI language model is *ChatGPT*. *ChatGPT*, short for *Chat Generative Pre-trained Transformer*, is an innovative *chatbot* based on AI language models developed by *OpenAI*. (OpenAI, L.L.C., San Francisco, California, United States of America – USA).

It is worth adding that *OpenAI* records approximately 1.4 billion visits to the *chatbot's official website* each month, with the platform's largest target audience being individuals between 25 and 34 years old. The transformer architecture of *ChatGPT* enables it to understand and generate human-like text responses in a conversational environment. As such, *ChatGPT* has become a versatile tool for a wide range of applications. Since its official launch in november 2022, *ChatGPT* has attracted considerable attention from both the general public and the scientific community (Liu *et al*., 2023; Farhat *et al*., 2024; Lathabai, Prabhakaran & Raman, 2024; Oliński, Krukowski & Sieciński, 2024; Koo, 2025).

ChatGPT is a general-purpose (NLP) system, capable of performing any task that involves such processing. GPT, short for Generative Pre-trained Transformer, is a statistical language model that measures the probability distribution of a sequence of words. In this sense, GPT estimates and determines which text to present as a response to a *prompt* it receives from a human input. However, the quality of the output largely depends on the *prompt*. In a hypothetical example, a person wants to improve their persuasive skills in negotiation. They can input a description of the context and their desired goals into ChatGPT and ask for advice (the prompt). *ChatGPT* will then assess the probability distribution of a sequence of words to generate a response to that *prompt* and recommend persuasion strategies (the output). Thus, the better the *prompt* that is, the more complete, relevant, and well-structured the information the better the suggestions generated by *ChatGPT* (Urdan & Marson, 2024).

Given the above, countless benefits of using *ChatGPT* can be cited. In many companies, for example, daily activities can become more productive through the use of this technology to understand concepts, summarize information, build and evaluate recommendations, and optimize processes through algorithms, among other tasks. However, the indiscriminate use of AI as is the case with *ChatGPT* has been increasingly debated in contemporary academic literature, thereby intensifying concerns regarding ethical aspects. More precisely, the use of machines and the automatic generation of knowledge exclude certain traditional processes of learning acquisition that is, the human ability to think, reason, plan, perceive, adapt, and perform induction, deduction, and logic, as well as to communicate. These are common skills of human intelligence (Maciel, 2023).

It is further noted that AI has become an indispensable tool for researchers, accelerating discoveries and fostering processes. However, the use of such algorithms raises concerns about bias, transparency, and accountability, as the ability of machines to learn and generate information and knowledge challenges traditional paradigms of authorship and credibility, placing integrity and ethics under renewed scrutiny. Therefore, it is essential to keep ethics and integrity at the core of AI research to ensure that its advancement benefits humanity in a fairer and more responsible way, this highlights the need for a holistic approach that involves education, transparency, accountability, and the active participation of multiple stakeholders in science. Thus, it is reiterated that, as we enter this new era of AI driven discoveries, we must embrace both the opportunities and the ethical challenges it presents, ensuring that the use of AI in scientific research continues to benefit humanity by promoting knowledge and well-being (Limongi, 2024).

In this sense, it is reiterated that the academic community foresees possible negative consequences from the use of *ChatGPT* based AI in the development of academic papers, dissertations, and theses. Given this, it is important to highlight that researchers around the world have already begun to use *ChatGPT* to develop their information and knowledge bases. As a result, some outcomes have already proven to be highly favorable such as the accurate review of documents, data, and information, and even the debate of ideas. Additionally, texts

with a wide range of specificities are already being produced. However, despite these optimistic possibilities, *ChatGPT* also presents limitations and risks to the accuracy and ethical integrity of scientific studies. Thus, the literature on this subject has already begun to raise warnings concerning the need for caution regarding the risks and potential misuse of this tool (Farias, 2023; Lara, 2023).

Another important point of caution relates to the use and attribution of citations involving language and its application. In this context, apart from scientific articles in which *ChatGPT* itself is the analytical unit of research where its citation is acceptable within the theoretical framework references to the model as a method for obtaining data, information, and knowledge should be properly disclosed in the methodology sections, whether under methodology, methodological procedures, or materials and methods. In this context, *ChatGPT* can truly be characterized as a revolution or a disruptive innovation (evolution) in the way data, information, knowledge, and insights are obtained and disseminated for investigations in scientific and technological research (Lara, 2023).

Given the above, one can engage in a mental exercise by imagining a scenario in which five authors use *ChatGPT* to produce a scientific article on the same topic. There is, therefore, a high probability that all texts would display significant similarities. As a result, plagiarism detection systems would likely identify the lack of authorial voice, and consequently, the studies would be rejected. In light of the above, it is essential to advocate that the misuse of AI tools, such as *ChatGPT,* to manipulate or distort scientific studies should be strictly penalized. Unfortunately, there have already been cases in the United States where authors used AI mechanisms to generate fake texts or to manipulate experimental findings. This discussion must be emphasized in the classroom starting from undergraduate education as it is the mission of educators to train professionals capable of thinking critically, identifying opportunities and challenges for businesses, society, and governments, as well as generating solutions to complex problems. Therefore, simply typing a question into a computer using the *ChatGPT* tool will not lead to the development of professionals, either in the business or academic sphere, with the necessary competencies (Irigaray & Stocker, 2023).

Despite the dangers that *ChatGPT* may pose to science, it can also be seen as a useful tool that may relieve researchers from the often tedious and non-central task of writing. *ChatGPT* has the ability to generate text in an articulate and intelligent manner, thus, *ChatGPT* can assist scholars in saving time and effort when writing abstracts, scientific articles, and other academic documents. This allows researchers to focus on their true passion: the generation of new *insights* and the creative process. Rather than spending hours writing and revising academic research, authors can use that time to develop their theories and conduct more experiments. Furthermore, since automated writing may be less prone to human error, there may be fewer mistakes and inconsistencies in scientific works produced with the help of *ChatGPT* (Rossoni, 2022).

3 METHODOLOGICAL PROCEDURES

The objective of this study was to investigate the profile and dynamics of the *ChatGPT* theme in scientific research published within the Brazilian academic context from the perspective of SNA. To this end, SNA was employed, as it is a method that contributes to research seeking to expand understanding and deepen comprehension of the interactions among research actors, such as: publication periods, journals, co-authors, higher education institutions HEIs, citations, and keywords. Furthermore, SNA aims to identify the existence of

research groups that may serve as academic reference points on a given topic (Callado & Silva, 2018; Ribeiro, Corrêa, Pierot & Leal, 2024), as is the case with *ChatGPT.*

It is important to note that SNA can be composed of *one-mode* social networks and *two-mode* social networks. More precisely, two-mode networks involve interactions between two distinct sets of actors, as the term "mode" refers to the specific categories to which the actors belong. Thus, a one-mode network is characterized by actors in a social network having relationships with other actors from the same category, such as a social network of authors. In contrast, a two-mode network differs in that its actors have connections with actors from different categories. In this way, a two-mode network is represented by the relationship between distinct actors within a single social network functioning as a unified social system, an example of this would be the relationships between researchers and journals (two different sets of actors) within the same social network (Tomaél & Marteleto, 2013; Ribeiro, 2025).

In this sense, SNA indicators (sociometric indicators) enable the investigation of the structure and formation of social networks, with regard to both one-mode and two-mode networks. It is important to highlight that the structures and formations of social networks are analyzed through the components that constitute them, namely: nodes (actors) and ties (connections between actors), dyads (connections composed of two actors), triads (connections formed by a set of three actors), *small-world* networks (groups of actors with strong ties), structural holes (gaps or failures in the structure of the social network), density (the number of existing relationships among actors), and centrality (actors with the highest number of connections/partnerships) (Tomaél & Marteleto, 2013; Köhler & Digiampietri, 2021; Melo, Jesus & Musial, 2024; Ribeiro, 2024b).

Thus, density is a measure that focuses on the intensity of internal cohesion within a social network. In this way, when a direct relationship exists between all actors in the network, the social network is referred to as a complete social network. Considering this, the density of a network is defined as the ratio between the total number of existing interactions in the social network and the maximum possible number of connections for that network (in other words, the condition for it to be considered a complete social network). It is noted that network density ranges from 0 to 1, where 0 means that all actors in the social network are disconnected, and 1 indicates that all actors are fully connected. Additionally, density reveals that the denser the network, the closer its measurement is to 1, meaning the actors are more harmoniously connected, a social network with low density is typically calculated with a value below 0.2, indicating that it is a dispersed network with low internal cohesion (Williams dos Santos & Farias Filho, 2016; Grácio, 2018).

Now, regarding centrality measures, particular emphasis is placed on *degree* centrality and *betweenness* centrality. These measures are among the most commonly used by authors in studies focused on SNA. *Degree* centrality highlights the number of relationships an actor has with other actors in the network, thereby allowing one to identify the actor's structural position in relation to others, thus, the higher the *degree* measurement, the greater the centrality of the actor. *Betweenness* centrality, on the other hand, emphasizes the number of shortest paths between any two actors for example, between "actor a" and "actor b" that pass through "actor c". In this way, *betweenness* reflects the actor's capacity to mediate the flow and exchange of information, communication, and knowledge among the actors in the network. It is also worth noting that both *degree* and *betweenness* centrality are commonly represented as percentages in actor networks (Grácio, 2018; Favaretto & Francisco, 2017; Facin, Barbosa, Matsumoto, Cruz & Salerno, 2022; Ribeiro, 2024b).

Among these centrality properties, this study utilized only betweenness centrality, as it is the most fundamental in establishing interactions between actor *clusters*, that is, *betweenness* serves as a "bridge" for relationships between actors. In this research, these actors were authors, higher education institutions HEIs, keywords, and citations (Favaretto & Francisco, 2017; Ribeiro, 2025).

3.1 Data Collection and Analysis Procedures

The research universe focused on scientific articles published in journals indexed in the SPELL database. The decision to use SPELL for locating studies on the BRICS theme is further supported by the fact that this database, since 2015, has begun to measure the impact factor of indexed scientific journals, using the following indicators: (a) average number of references per scientific article; (b) impact (two and five years); (c) immediacy index; (d) self-citation rate; (e) impact (two years without self-citation); (f) impact (five years without self-citation); (g) citation half-life; and (h) H-index (Rafael, 2023). It is worth reiterating that SPELL is one of the main databases used by researchers in literature review studies, such as those employing sociometry (Ribeiro, 2023b).

The sample collection procedure for scientific articles on *ChatGPT* was carried out as follows: a) entering the selected keywords into the SPELL database search filter titled *"drop down boxes"* b) selecting scientific articles on *ChatGPT* from SPELL; c) searching for the keywords within the following fields: titles, abstracts, and keywords of studies related to *ChatGPT*; d) defining the sample through the reading of titles and/or abstracts of each study on *ChatGPT*. In SPELL, a filter was applied using the keywords: *"ChatGPT"* and *"Chat GPT."*

The use of these keywords is justified by their relevance and global adherence to the *ChatGPT* theme (Farhat *et al*., 2023; Raman *et al*., 2023; Farhat *et al*., 2024; Lathabai, Prabhakaran & Raman, 2024; Mubin *et al*., 2024; Oliński, Krukowski & Sieciński, 2024; Carreño, 2025; Koo, 2025). It is also important to note that the aforementioned Keywords *ChatGPT* were entered asynchronously into the *drop down boxes* to search for scientific articles on *ChatGPT*, in order to ensure that all relevant studies on the topic were identified within the SPELL database.

It is stated that the start and end dates for the search and subsequent tabulation of data from the studies took place between 22/05/2025, and 23/05/2025. As a result, the sample returned 20 publications, including scientific articles, editorials, and opinion papers (*pensatas*), covering a time frame from 2022 to 2024, totaling three years. It is important to highlight that this time frame was conditioned by the availability of studies found in the SPELL database system that is, the first study on *ChatGPT* was found in 2022, and the most recent publication occurred in 2024, specifically on 23/05/2025. It is also noted that the measurement of SNA indicators, as well as the creation of symmetric matrices (*one-mode networks*) and asymmetric matrices (*two-mode networks*) of the actors' social networks along with their respective graphical visualizations took place between the start date of 23/05/2025, and the end date of 28/05/2025.

It is important to highlight that the SNA data and information were measured using the *UCINET software*, and the graphical visualization of the social networks was performed using the *NetDraw software*. It is also noted that the analysis of the 20 scientific articles was carried out based on the following SNA indicators: (i) two-mode networks of publication periods and authors; (ii) two-mode networks of journals and authors; (iii) co-authorship networks; (iv) networks of higher education institutions (HEIs); (v) co-citation networks; and (vi) keyword networks.

It is important to note that, to better visualize the co-citation networks in this study, codes were created for the actors (Tomaél & Marteleto, 2013), such as code 31, which corresponds to the citation of: Rossoni, L. (2022) which corresponds to the authors Luciano Rossoni. It is also important to note that these codes were created in *software Microsoft Excel* spreadsheets as the citations were being identified and tabulated in the symmetric matrix of the co-citation networks. Thus, each code does not represent the citation's level of influence in terms of betweenness centrality, but rather the row number in the spreadsheet corresponding to the moment when the citations were found in the respective studies (Ribeiro *et al.*, 2024). To conclude, Figure 1 was created to illustrate the step-by-step process of the methodological approach used in this research.

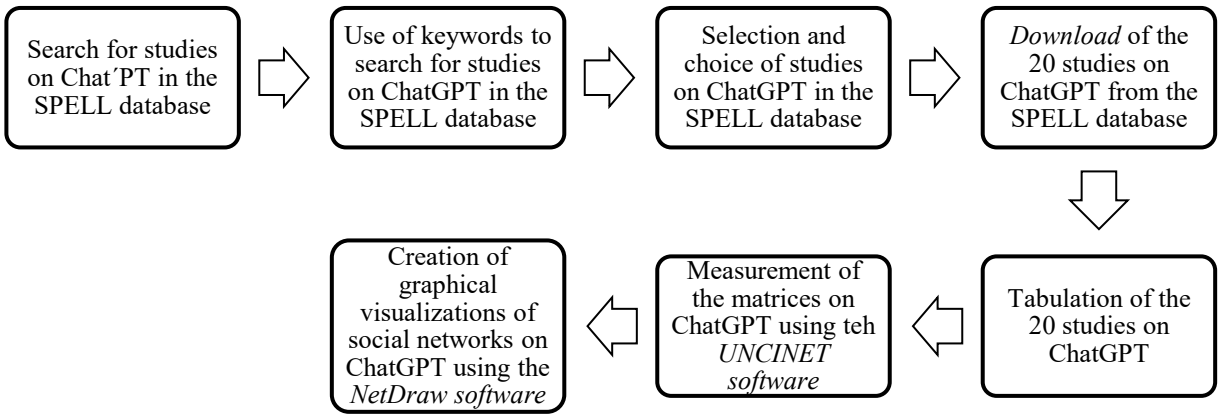

Figure 1: Methodological Path
Source: Prepared by the author (2025)

4 RESULTS ANALYSIS AND DISCUSSION

This section presents the analysis and discussion of the 20 scientific articles on ChatGPT, from the perspective of journals indexed in the SPELL database and through the lens of SNA.

4.1 Two-mode networks of publication periods and authors

Figure 2 reveals the two-mode networks of the three publication periods and the 47 authors. It is important to note that *degree* centrality was the metric used to identify the most central periods from the authors' perspective.

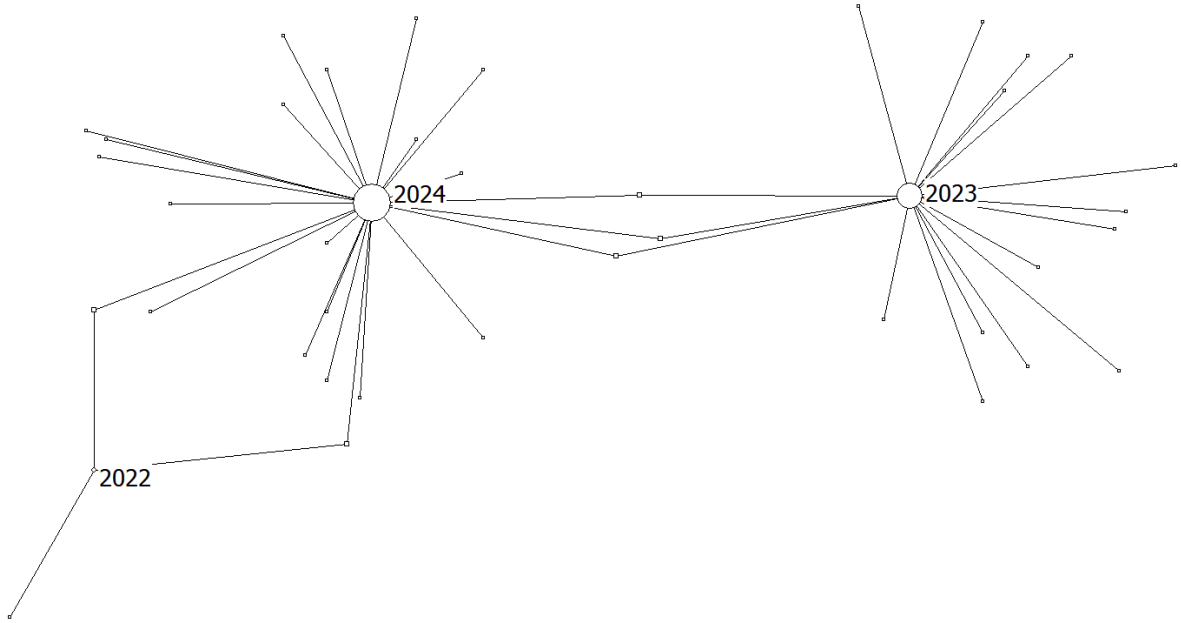

Figure 2: Two-mode networks of publication periods and authors
Source: Research data (2025)

Accordingly, the years that stood out were: 2024, 2023, and 2022. Based on this result, it becomes clear that the topic *ChatGPT*, within the Brazilian academic literature and from the perspective of journals indexed in the SPELL database, has been increasingly attracting researchers, in other words, with each passing period, more and more scholars have been conducting research and publishing their respective findings and contributions on *ChatGPT*, starting in 2022, the year *ChatGPT* was launched, and extending through 2024. The result presented here is similarly supported by analogous studies conducted in the international scientific contexto (Farhat, Silva, Hassani, Madsen, Sohail, Himeur, Alam & Zafar, 2024; Lathabai, Prabhakaran & Raman, 2024; Oliński, Krukowski & Sieciński, 2024; Koo, 2025), showing and confirming a possible growth trend of *ChatGPT* in the global scientific literature, as well as within the Brazilian academic context, from the perspective of the SPELL database and, consequently, the scientific journals indexed by this database.

4.2 Two-mode networks of journals and authors

Figure 3 highlights the two-mode networks of the 14 journals and the 47 authors. It is noted that degree centrality was chosen to emphasize the most central scientific journals from the authors' perspective.

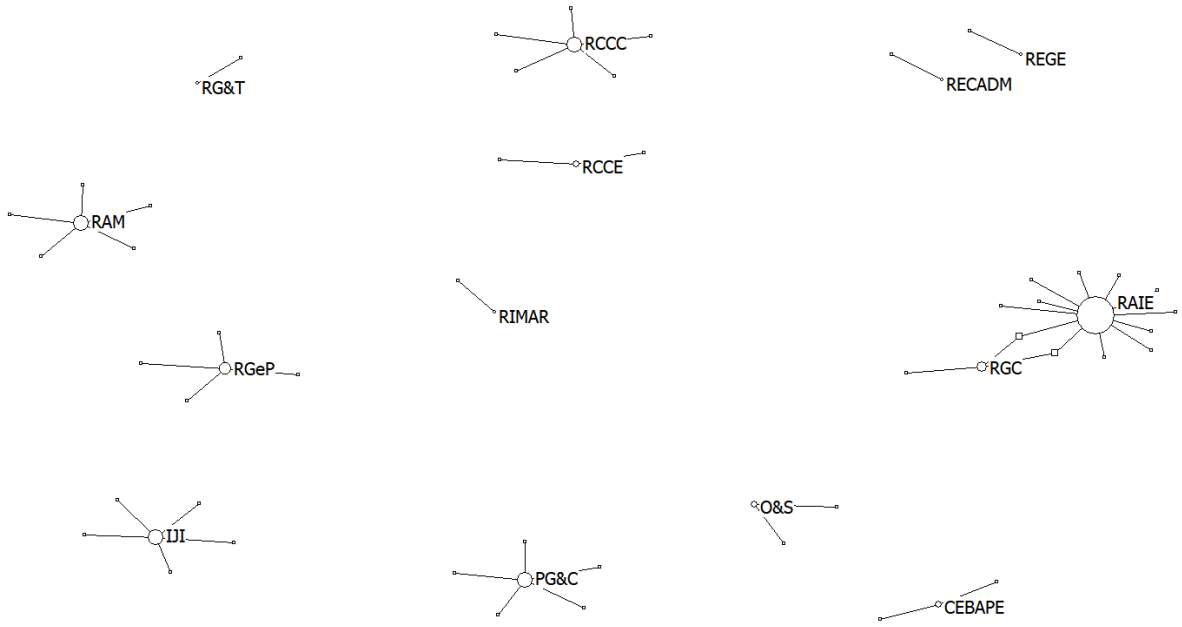

Figure 3: Two-mode networks of journals and authors
Source: Research data (2025)

In light of the above, the most central journals were: *Review of Artificial Intelligence in Education* (RAIE), *International Journal of Innovation* (IJI), Perspectives in Management & Knowledge (Perspectivas em Gestão & Conhecimento – PG&C), Santa Catarina Journal of Accounting Science (Revista Catarinense da Ciência Contábil – RCCC), and Mackenzie Journal of Management (Revista de Administração Mackenzie – RAM). Among these, RAIE stands out the most, as it brought together 16 authors who published on *ChatGPT*, making it the most influential journal on the topic of *ChatGPT* in this study.

In addition to the journals that received greater emphasis, it is also important to highlight the others identified in this study. These are: Journal of Project Management (Revista de Gestão e Projetos RGeP), Journal of Corporate Governance (Revista de Governança Corporativa RGC), EBAPE.BR Notebooks (Cadernos EBAPE.BR CEBAPE), Organizations & Society (Organizações & Sociedade O&S), Scientific Capital Journal Online (Revista Capital Científico-Eletrônica RCCE), Journal of Management (Revista de Gestão REGE), Electronic Journal of Administrative Science (Revista Eletrônica de Ciência Administrativa RECADM), Journal of Management & Technology (Revista Gestão & Tecnologia RG&T), Interdisciplinary Journal of Marketing (Revista Interdisciplinar de Marketing RIMAR).

At a macro level, it is observed that the vast majority of the 14 scientific journals identified in this study are more closely aligned with the field of knowledge in management (CEBAPE, IJI, O&S, PG&C, REGE, RAIE, RCCE, RAM, RGeP, RGC, RECADM, RG&T e RIMAR), with the exception of the journal RCCC, which is more closely related to Accounting Sciences. In summary, the researchers, in this study aim to publish their respective findings and contributions in academic journals more closely linked to the field of Business Administration, a finding that is similarly supported by other analogous studies in academia (Farhat *et al.*, 2023; Raman *et al.*, 2023; Farhat *et al.*, 2024; Lathabai, Prabhakaran & Raman, 2024; Mubin *et al.*, 2024; Oliński, Krukowski & Sieciński, 2024; Carreño, 2025; Koo, 2025).

4.3 Co-authorship networks

Figure 4 visualizes the co-authorship networks, which were composed of 47 nodes and 120 ties.

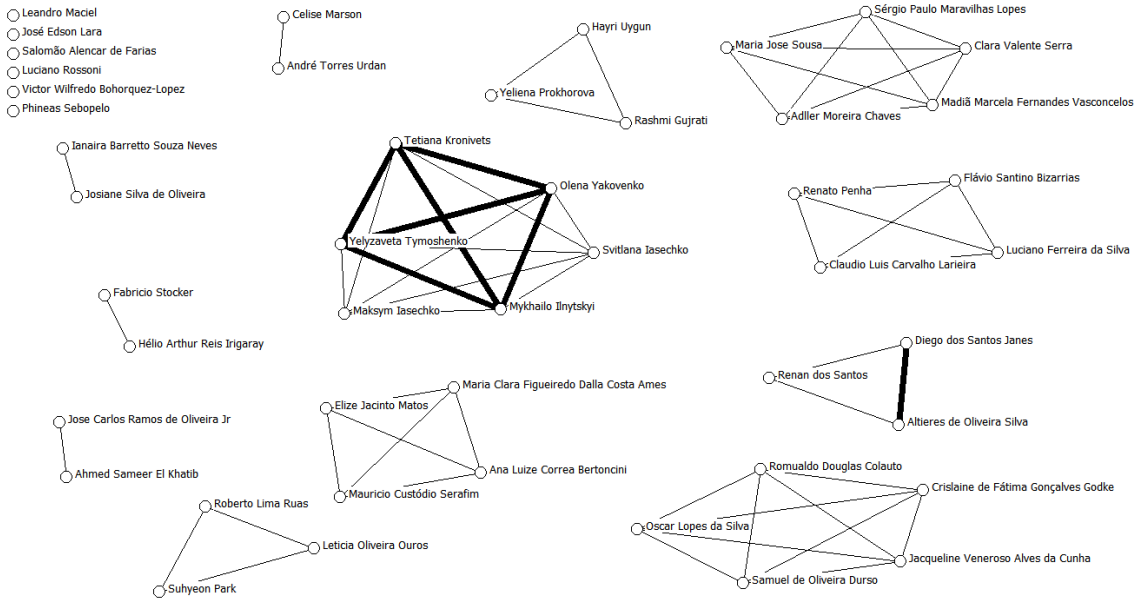

Figure 4: Co-authorship networks
Source: Research data (2025)

By examining Figure 4, it is observed that the most dominant relationships among the authors were formed through dyads and triads. Additionally, larger research groups composed of four or more researchers each were also identified, directly influencing the flow of information and the exchange of knowledge and insights related to the subject under investigation. It is also noteworthy that some researchers published on the central theme of this scientific article individually (six authors), therefore, it can be understood and consequently inferred that the co-authorship networks in this study are considered multi-relational social networks, as they present more than one type of tie, in other words, multiple forms of interaction among the authors (Melo, Jesus & Musial, 2024).

Still analyzing the co-authorship networks in Figure 4, it is observed that their density was measured at 0.0620, indicating that only 6.20% of the 47 authors effectively interacted with each other. Therefore, for the purposes of this study, it can be considered that the researcher network identified in this scientific article exhibits low density, directly contributing to the emergence of a dispersed social network, which, in turn, leads to the appearance of structural holes, thereby resulting in the presence of so-called *small-world* structures, and consequently, weak ties among researchers, this results in low internal cohesion within the network, which simultaneously interferes with the fluidity and harmonization of the flow and exchange of information, knowledge, and communication regarding the subject of analysis in this study (Williams dos Santos & Farias Filho, 2016; Favaretto & Francisco, 2017; Ribeiro, 2025).

4.4 Networks of HEIs

Figure 5 identifies the networks of HEIs, which were composed of 31 nodes and 58 ties. It is emphasized that the measure used to highlight the most central HEIs was *betweenness* centrality

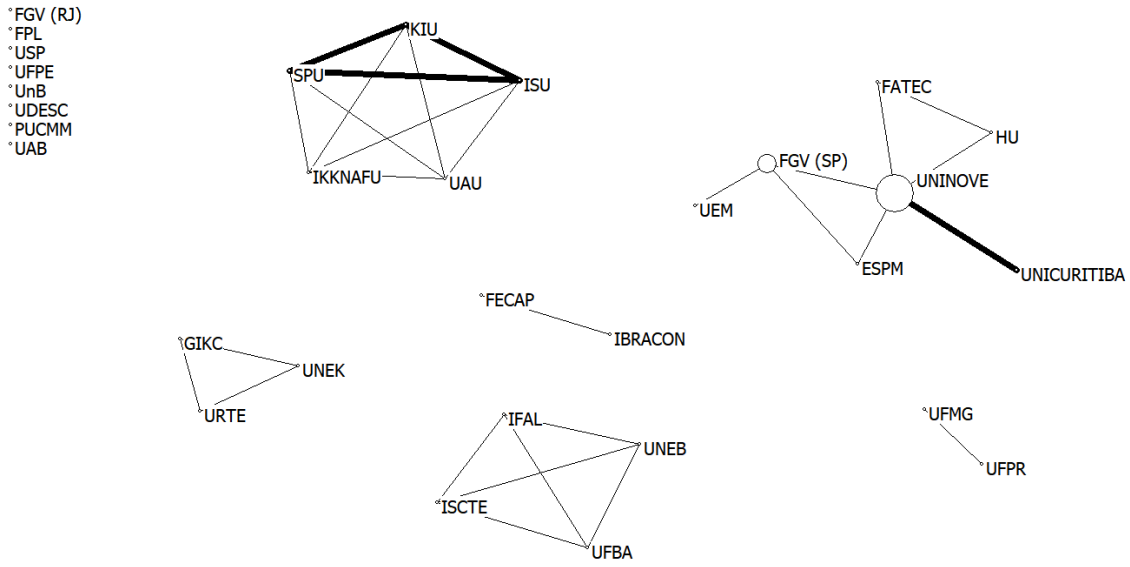

Figure 5: Networks of HEIs
Source: Research data (2025)

In this way, the most central HEIs were: Nove de Julho University (UNINOVE) and Getulio Vargas Foundation of São Paulo (FGV-SP). This result is similarly supported by the study of Cunha (2024), which aimed to investigate the participation of women in the development of scientific research related to AI in graduate programs in Brazil. In light of the above, it is reiterated that the rapid advances in AI have impacted the progress of enhanced language models capable of understanding and generating human-like texts, and one of the most renowned AI language models is *ChatGPT* (Liu *et al*., 2023).

Still analyzing Figure 5, it is evidenced that its density was measured at 0.0710, meaning that only 7.10% of the relationships among the 31 HEIs identified in this research were effectively established. This finding aligns with what was observed in the co-authorship networks of this investigation, and therefore, the conclusion is similar, since the HEI network has low density, which directly influences its internal cohesion and, synchronously, impacts the harmonization of information flow and knowledge exchange among the HEIs regarding the subject matter of this scientific article (Williams dos Santos & Farias Filho, 2016; Favaretto & Francisco, 2017; Grácio, 2018; Ribeiro, 2023a), thus impacting its evolution, improvement, and maturation within the Brazilian academic context, from the perspective of journals indexed in the SPELL database system.

4.5 Co-citation Networks

Figure 6 reveals the co-citation networks, which consisted of 522 nodes and 25.476 ties. Its giant component comprised 370 nodes and 19.540 ties. It is emphasized that citation analysis is important for revealing the impact and influence of research related to ChatGPT in academia (Koo, 2025).

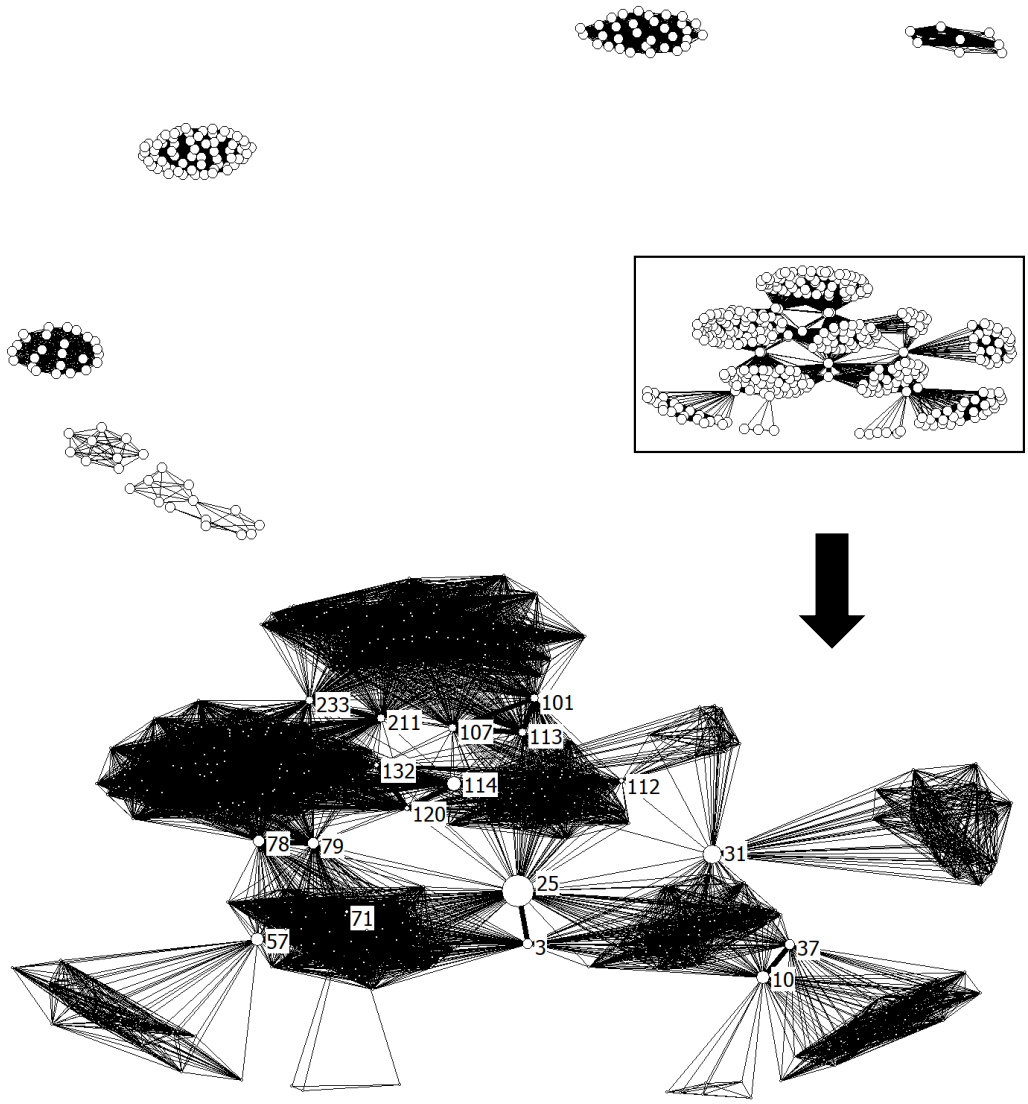

Figure 6: Co-citation Networks
Source: Research Data (2025)

It is emphasized that betweenness centrality was used to highlight the most central citations (references), which are visualized through the giant component in Figure 6. In light of the above, it is evident that the giant component in Figure 6 highlights and indicates the presence of a flow, and simultaneously, a greater exchange of information and knowledge among a large number of actors in the network (Sampaio *et al*., 2015; Köhler & Digiampietri, 2021; Ribeiro *et al*., 2024), which, in this case, are the citations. Furthermore, the most central citations are represented by larger circles, highlighting higher citation counts and stronger links with other citations (Farhat *et al*., 2024).

Thus, the most central citations, in descending order of influence, were: 25. OpenAI. (2023); 31. Rossoni, L. (2022); 114. Lund, B. D., & Wang, T. (2023); 57. Gilson, A., Safranek, C. W., Huang, T., Socrates, V., Chi, L., Taylor, R. A. & Chartash, D. (2023); 10. Dowling, M., & Lucey, B. (2023); 79. Salvagno, M., Taccone, F. S. & Gerli, A. G. (2023); 78. Rudolph, J., Tan, S. & Tan, S. (2023); 3. Biswas, S. S. (2023); 37. Zaremba, A., & Demir, E. (2023); 211. Crawford, J., Cowling, M., & Allen, K. A. (2023); 233. Lim, W. M., Gunasekara, A., Pallant, J. L., Pallant, J. I., & Pechenkina, E. (2023); 101. Dwivedi, Y. K., Kshetri, Kshetri, N., Hughes, L., Slade, E. L., Jeyaraj, A., Kar, A. K., Baabdullah, A. M., Koohang, A., Raghavan, V., Ahuja, M., Albanna, H., Albashrawi,

M. A., Al-Busaidi Al-Busaidi, A. S., Balakrishnan, J., Barlette, Y., Basu, S., Bose, I., Brooks, L., Buhalis, D., Carter, L., & Wright, R. (2023); 113. Lund, B. D., Wang, T., Mannuru, N. R., Nie, B., Shimray, S., & Wang, Z. (2023); 107. Korzynski, P. et al. (2023); 120. Perkins, M. (2023); 132. Dis, E. A. M., van, Bollen, J., Rooij, R., van, Zuidema, W., & Bockting, C. L. (2023); 112. Lucy, L., & Bamman, D. (2021); e 71. O'Connor, S., & ChatGPT (2023).

Therefore, these most central citations reflect the flow of knowledge among publications on the topic of *ChatGPT* in the academic literature. Additionally, these central citations reveal a key aspect that determines the current growth of the subject, as well as the potential growth of these most influential citations in the research on the investigated theme and also in the scientific literature related to the main topic of this study (Lathabai, Prabhakaran & Raman, 2024), in the brazilian scientific context, from the perspective of journals indexed in the SPELL database. Regarding this, it is added that the analysis of the citation networks in this study led to the identification of the most influential scientific articles on the research about the *ChatGPT* tool in the field of knowledge (Oliński, Krukowski & Sieciński, 2024), of Administration, Accounting, and Tourism, from the viewpoint of the SPELL database.

4.6 Keyword Networks

Figure 7 highlights the keyword networks, which were composed of 40 nodes and 222 ties. It is important to note that the 20 scientific articles analyzed contained, in total, 40 occurrences of keywords, to arrive at this number of unique keywords, the following criteria were applied and maintained: (i) no distinction was made between uppercase and lowercase letters; and (ii) singular and plural forms of keywords were kept as separate entries (Favaretto & Francisco, 2017).

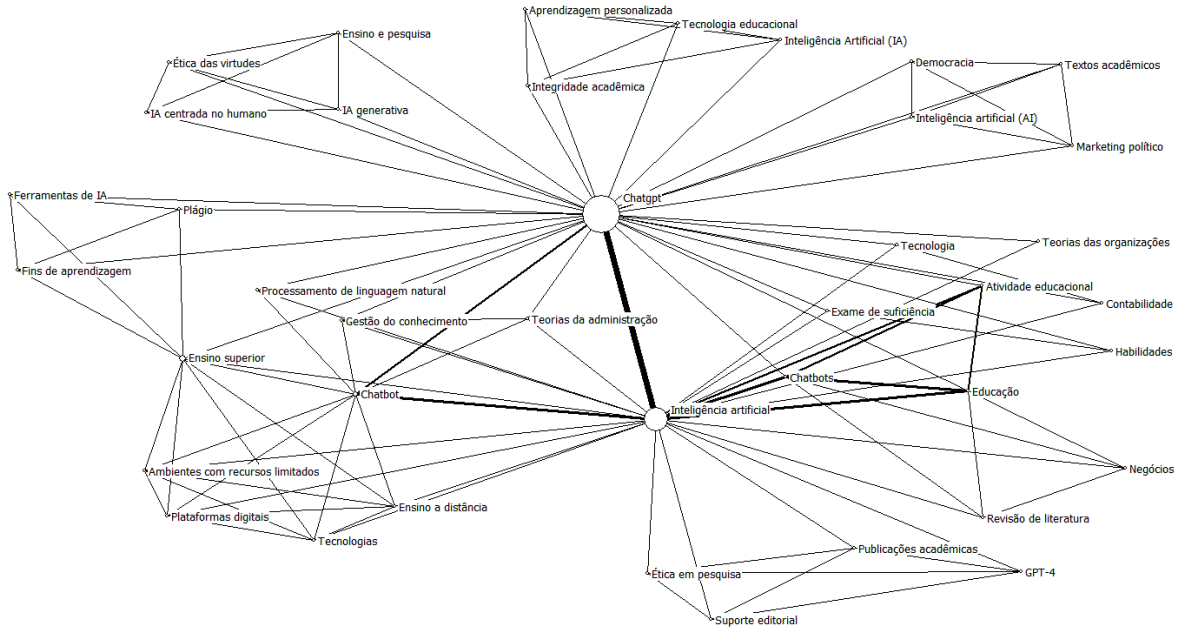

Figure 7: Keyword Networks
Source: Research data (2025)

As a result, the most central keywords in this research were visualized, listed in descending order of relevance: *chatgpt,* artificial intelligence, higher education, *chatbot, chatbots,* and education. It is worth noting here that the keyword *chatgpt* ranked among the most central in this study because it was one of the keywords used to search for scientific articles on the topic of *ChatGPT* in the SPELL database.

Regarding these most central keywords, it can be understood that: (i) they significantly influence the understanding of thematic concentrations in the scientific literature studied on *ChatGPT*, providing an overview of the investigated field; (ii) notably, the most prevalent keyword is *ChatGPT*, followed by artificial intelligence, indicating that these are the most popular terms among authors researching the topic; (iii) these central keywords highlight the interdisciplinary nature of *ChatGPT,* particularly with a focus on the field of Technology; and (iv) they have the 'power' to support, guide, and mediate the flow of communication, knowledge, information, and understanding related to the core theme of this study (Favaretto & Francisco, 2017; Facin *et al*., 2022; Urbizagástegui-Alvarado, 2022; Farhat *et al*., 2024; Oliński, Krukowski & Sieciński, 2024; Carreño, 2025; Koo, 2025; Ribeiro, 2025).

5 CONCLUSION

The objective of this study was to investigate the profile and dynamics of the ChatGPT theme in scientific research published within the brazilian academic context from the perspective of (SNA. To this end, sociometric analysis was applied to 20 identified studies on the *ChatGPT* topic. The findings revealed that *ChatGPT* is a tool experiencing significant growth in the Brazilian academic landscape, as the years 2022, 2023, and 2024 have been increasingly attracting authors who publish research on *ChatGPT*. In other words, from 2022 to 2024, there has been a steady increase in the number of researchers sharing their results and contributions related to *ChatGPT* in Brazilian academia, particularly through journals indexed in the SPELL database.

Regarding the scientific journals, the most active one is the *Review of Artificial Intelligence in Education*. The prominence of this journal may be due to its focus and scope dedicated to advancing scientific knowledge through the applications, implications, and innovations of AI in the educational context. Additionally, it aims to optimize multidisciplinary dialogue between researchers and policymakers in the fields of education, management, and technology (RAIE, 2025). Regarding the authors, in terms of relationships among academics, the strongest partnerships (thick ties in Figure 4) occurred between the scholars: Altieres de Oliveira Silva and Diego dos Santos Janes; and Tetiana Kronivets, Olena Yakovenko, Yelyzaveta Tymoshenko, and Mykhailo Ilnytskyi, who published two investigations on *ChatGPT* within the brazilian academic context, according to the journals indexed in the SPELL database platform.

Regarding the HEIs, the most influential were: UNINOVE and FGV (SP). In relation to UNINOVE and FGV (SP), it can be stated, for this study, that these institutions are the most important and influential in mediating the flow and exchange of information, knowledge, and know-how (Favaretto & Francisco, 2017; Grácio, 2018; Ribeiro, 2024b) regarding the topic of *ChatGPT* in the national scientific literature, in light of the academic journals indexed in the SPELL database. Concerning the citations, the most central ones were: OpenAI. (2023), Rossoni, L. (2022) e Lund, B. D., & Wang, T. (2023). Among these citations, special emphasis is placed on the Brazilian author Luciano Rossoni, through his work “Artificial Intelligence and Me: Writing the Editorial Together with ChatGPT,” highlighting his prominence among the 522 citations identified in this research.

Regarding the keywords, the most central were: *chatgpt*, artificial intelligence, higher education, *chatbot, chatbots*, and education. Therefore, it is emphasized that these most central keywords, as shown in Figure 7, are of great significance and utility for better understanding and comprehension of the subject under analysis in the scientific context, especially for researchers beginning studies in this research área, additionally, knowledge of these most central keywords allows the identification of the main terms found in the academic

works that comprised the sample, thus providing insight into the predominant field of knowledge around the line of research on the investigated topic (Liang *et al*., 2022) within the brazilian scientific context, in light of the journals indexed in the SPELL database system.

Regarding theoretical implications, this investigation contributed to the field of Administration and related areas by emphasizing an understanding and, subsequently, a comprehension of *ChatGPT* through the lens of SNA. The study also contributed by investigating the profile and dynamics of actors in the structure and formation of social networks concerning *ChatGPT*, thereby enabling the generation of academic value and fostering a greater understanding and comprehension, simultaneously leading to the evolution and maturation of scientific production related to *ChatGPT* research in the national academic literature. Regarding practical implications, this scientific article provided a possible guideline for companies through the themes that support and guide *ChatGPT* (the most central keywords of this research) in the formulation and execution of potential strategies aimed at the improvement and development of *ChatGPT* in Brazil.

As a limitation, this scientific article used only the SPELL database; therefore, relying solely on SPELL may distort perceptions of impact, such as SPELL's focus on publications in the Portuguese language. Thus, as a recommendation for future research, it is suggested to: (i) optimize this scientific work by using other national and international databases, such as *Google Scholar, Web of Science*, *Scopus*, Scielo, *Ebsco, Proquest*, CAPES Journals, among others; (ii) analyze the centralities of actors using citations from other databases; (iii) expand the number of keywords, for example, "responsible AI," "plagiarism detection"; (iv) conduct a Systematic Literature Review of the sample of the 20 investigations identified in this scientific study.

REFERENCES

Callado, A. L. C., & Silva, A. R. da. (2018). Características da produção científica associada à intangibilidade e desempenho econômico-financeiro sob a perspectiva de redes sociais. *Desafio Online*, *6*(1), 122-140.

Carreño, I. D. V. G. (2025). Reflections on chatgpt in the field of social sciences: a bibliometric study. *The European Educational Researcher*, *8*(1), 5-28.

Cui, P., & Dong, Y. (2025). Mapping the intellectual structure of social network research: a comparative bibliometric analysis. *arXiv:2502.07412v1 [cs.SI]*, 1-27.

Cunha, L. A. dos S. M. (2024). *A ciência como fator da igualdade de gênero na era da inteligência artificial*: um panorama sobre a pesquisa de ia na pós-graduação no Brasil. Dissertação (Mestrado em Gestão & Organização do Conhecimento), Universidade Federal de Minas Gerais.

Dias, G. A., Silva, A. K. A. da, França, A. L. D. de, Souza, L. B. R. H. de, & Silva, A. C. de B. M. (2018). Análise de redes sociais no processo de mediação em rede de coautoria: avaliação das dinâmicas de colaboração docente. *Informação & Informação*, *23*(3), 417-437. https://doi.org/10.5433/1981-8920.2018v23n3p417

Facin, A. L. F., Barbosa, A. P. F. P. L., Matsumoto, C., Cruz, A. F. S. da G., & Salerno, M. S. (2022). Temas de destaque na pesquisa em transformação digital: evidências de estudo bibliométrico e análise de conteúdo. *Revista de Administração de Empresas*, *62*(6), 1-22. http://dx.doi.org/10.1590/S0034-759020220602

Farhat, F., Silva, E. S., Hassani, H., Madsen, D. Ø., Sohail, S. S., Himeur, Y., Alam, M. A., & Zafar, A. (2023). Analyzing the scholarly footprint of chatGPT: mapping the progress and identifying future trends. *Preprints*, 1-21. https://doi.org/10.20944/preprints202306.2100.v1

Farhat, F., Silva, E. S., Hassani, H., Madsen, D. Ø., Sohail, S. S., Himeur, Y., Alam, M. A., & Zafar, A. (2024). The scholarly footprint of ChatGPT: a bibliometric analysis of the early outbreak phase. *Frontiers in Artificial Intelligence*. *6*, 1-18. https://doi.org/10.3389/frai.2023.1270749

Farias, S. A. de. (2023). Pânico na academia! inteligência artificial na construção de textos científicos com o uso do ChatGPT. *Revista Interdisciplinar de Marketing*, *13*(1), 79-83. https://doi.org/10.4025/rimar.v13i1.66865

Favaretto, J. E. R., & Francisco, E. de R. (2017). Exploração do acervo da RAE-Revista de Administração de Empresas (de 1961 a 2016) à luz da bibliometria, text mining, rede social e geoanálise. *Revista de Administração de Empresas*, *57*(4), 365-390. http://dx.doi.org/10.1590/S0034-759020170407

Grácio, M. C. C. (2018). Colaboração científica: indicadores relacionais de coautoria. *Brazilian Journal of Information Studies: Research Trends*, *12*(2), 24-32.

IBEPES. (2024). SPELL- Scientific Periodicals Electronic Library. *Revista Áudio e Base de Dados*, *1*, ID25. Recuperado em: https://econtents.bc.unicamp.br/pas/index.php/jad/article/view/301.

Irigaray, H. A. R., & Stocker, F. S. (2023). ChatGPT: um museu de grandes novidades. *Cadernos EBAPE.BR*, *21*(1), 1-5. http://dx.doi.org/10.1590/1679-395188776

Köhler, A. F., & Digiampietri, L. A. (2021). Pós-graduação em turismo no Brasil: uma análise bibliométrica e de redes sociais. *Rosa dos Ventos*, *13*(4), 945-966. https://doi.org/10.18226/21789061.v13i4p966

Koo, M. (2025). ChatGPT research: a bibliometric analysis based on the web of science from 2023 to june 2024. *Knowledge*, *5*(4), 1-15. https://doi.org/10.3390/knowledge5010004

Lara, J. E. (2023). Reflexões editoriais sobre a evolução da ciência e a contribuição do ChatGPT. *Journal of Management & Technology*, *23*(1), 1-3.

Lathabai, H. H., Prabhakaran, T., & Raman, R. (2024). ChatGPT research: insights from early studies using network scientometric approach. *Journal of Scientometric Research*, *13*(3), 688-705. https://doi.org/10.5530/jscires.20041177

Liang, X., Luo, L., Hu, S., & Li, Y. (2022). Mapping the knowledge frontiers and evolution of decision making based on agent-based modeling. *Knowledge-Based Systems*, *250*, 108982. https://doi.org/10.1016/j.knosys.2022.108982

Limongi, R. (2024). The use of artificial intelligence in scientific research with integrity and ethics. *Future Studies Research Journal*, *16*(1), 1-20. https://doi.org/10.24023/FutureJournal/2175-5825/2024.v16i1.845

Liu, Y., Han, T., Ma, S., Zhang, J., Yang, Y., Tian, J., He, H., Li, A., He, M., Liu, Z., Wu, Z., Zhao, L., Zhu, D., Li, X., Qiang, N., Shen, D., Liu, T., & Ge, B. (2023). Summary of ChatGPT related research and perspective towards the future of large language models. *Meta-Radiology*, *1*(2). https://doi.org/10.1016/j.metrad.2023.100017

Maciel, L. (2023). Editorial: ChatGPT and the ethical aspects of artificial intelligence. *Revista de Gestão*, *30*(2), 110-112. https://doi.org/10.1108/REGE-04-2023-207

Melo, F. J. de, Jesus, U. G. S. F. R. de, & Musial, N. T. K. (2024). Rede em rede eis a questão? *Pensar Contábil*, 26(90), 52-60.

Mubin, O., Alnajjar, F., Trabelsi, Z., Ali, L., Parambil, M. M. A., & Zou, Z. (2024). Tracking chatGPT research: insights from the literature and the web. *IEEE Access*, *12*, 30518- 30532.

Oliński, M., Krukowski, K., & Sieciński, K. (2024). Bibliometric overview of chatGPT: new perspectives in social sciences. *Publications*, *12*(9), 1-16. https://doi.org/10.3390/publications12010009

Oliveira, J. S. de, & Neves, I. B. S. (2023). Editorial inteligência artificial, chatGPT e estudos organizacionais. *Revista Organizações & Sociedade*, *30*(106), 397-409. https://doi.org/10.1590/1984-92302023v30n0013PT

Rafael, S. L. L. (2023). *SPELL*: ten years of contribution to science. Recuperado em: <https://anpad.org.br/en/newsletter-news/january-march-2023-edition-volume-3-issue-1/news/spell-ten-years-of-contribution-to-science/>.

Raman, R., Lathabhai, H., Diwakar, S., & Nedungadi, P. (2023). Early research trends on Chatgpt: insights from altmetrics and science mapping analysis. *International Journal of Emerging Technologies in Learning*, *18*(19), 13-31. https://doi.org/10.3991/ijet.v18i19.41793

Review of Artificial Intelligence in Education (RAIE). *Focus & Scope*. Recuperado em: < https://educationai-review.org/revista/Focus-Scope>

Ribeiro, H. C. M. (2023a). A produção científica sobre fraude no Brasil: uma investigação sob a perspectiva da análise de redes sociais. *Revista Universo Contábil*, 19(e2023102), 1-30. https://doi.org/10.4270/ruc.2023102

Ribeiro, H. C. M. (2024a). Bibliometria e sociometria: panorama e tendência no Brasil. *Perspectivas em Gestão & Conhecimento*, *14*(2), 135-164. https://dx.doi.org/10.22478/ufpb.2236-417X.2024v14n2.69341

Ribeiro, H. C. M. (2025). Clean development mechanism: Profile and behavior in brazilian academia from the perspective of social network analysis. *Contemporary Journal of Economics and Management*, *23*(e94488), 1-19. https://doi.org/10.36517/contextus.2025.94488

Ribeiro, H. C. M., Corrêa, R., Pierot, R. M., & Leal, L. G. do N. (2024). 20 anos do protocolo de Kyoto: perfil e comportamento na academia do brasil sob a perspectiva da análise de redes sociais. *Revista de Gestão Social e Ambiental*, *18*(11), 1-29. https://doi.org/10.24857/rgsa.v18n11-190

Ribeiro, H. C. M. (2024b). Global reporting initiative: representatividade e desempenho na esfera acadêmica brasileira. *Pretexto*, *25*(4), 45-63.

Ribeiro, H. C. M. (2023b). Produção científica dos estudos que utilizaram o método da revisão sistemática da literatura publicados pelos periódicos científicos indexados no SPELL. *Perspectivas em Gestão & Conhecimento*, *13*(2), 149-177. https://dx.doi.org/10.22478/ufpb.2236-417X.2023v13n2.65373

Rossoni, L. (2022). A inteligência artificial e eu: escrevendo o editorial juntamente com o ChatGPT. *Revista Eletrônica de Ciência Administrativa*, *21*(3), 399-405. http://dx.doi.org/10.21529/RECADM.2022ed3

Sampaio, R. B., Sacerdote, H. C. de S., Fonseca, B. de P. F., & Fernandes, J. H. C. (2015). A colaboração científica na pesquisa sobre coautoria: um método baseado na análise de redes. *Perspectivas em Ciência da Informação*, *20*(4), 79-92. http://dx.doi.org/10.1590/1981-5344/2447

Serra, C. V., Vasconcelos, M. M. F., Chaves, A. M., Lopes, S. P. M., & Sousa, M. J. (2024). ChatGPT: tessituras iniciais sobre a administração e conhecimento. *Perspectivas em Gestão & Conhecimento*, *14*(1), 88-106. https://dx.doi.org/10.22478/ufpb.2236-417X.2024v14n1.67296

Tomaél, M. I., & Marteleto, R. M. (2013). Redes sociais de dois modos: aspectos conceituais. *TransInformação*, 25(3), 245-253.

Urbizagástegui-Alvarado, R. (2022). Bibliometria brasileira: análise de copalavras. *TransInformação*, *34*(e220004), 1-20. https://doi.org/10.1590/2318-0889202234e220004

Urdan, A. T., & Marson, C. (2024). Moralidade e modelagem da intenção de uso da tecnologia ChatGPT. *International Journal of Innovation*, *12*(1), 1-45. https://doi.org/10.5585/2024.26378

Williams dos Santos, C., & Farias Filho, M. C. (2016). Agentes comunitários de saúde: uma perspectiva do capital social. *Ciência & Saúde Coletiva*, *21*(5), 1659-1667. https://doi.org/10.1590/1413-81232015215.23332015