

ARTIFICIAL INTELLIGENCE IN ACCOUNTING: A BIBLIOMETRIC ANALYSIS



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Sonia Aparecida Beato Ximenes de Melo¹, Elivelton Zaquimae Amajunepa², Evelyn Oliveira Cardoso Santos³, André Ximenes de Melo⁴, Grazielle Oliveira Aragão Servilha⁵, Márcio Íris de Moraes⁶.

ABSTRACT

The present study aims to analyze the scientific production on Artificial Intelligence (AI) in Accounting through a bibliometric study. In the search filters in the Web of Science database, the following keywords were used: "artificial intelligence" (Title) AND "accounting" (Title), resulting in 71 documents. The results showed a trend at the intersection between accounting and emerging technologies such as artificial intelligence, big data, and blockchain. Each research set highlights different aspects and applications of these technologies, from accounting education and practice to auditing and digital transformation. This diversity suggests a dynamic and rapidly evolving field of research, where technological innovation plays a central role. Technology has significant impacts on accounting, and understanding these changes allows professionals in the field to be prepared for the ongoing transformations. In this sense, accounting will not cease to exist, but it will need to seek its reason for existing to remain competitive in the face of new automated processes, acting mainly in the creation and authentication of information generated through automated processes, thus ensuring flexibility in decision-making.

Keywords: Robotic Process Automation, Machine Learning, Big Data.

¹ Dra.

University of the State of Mato Grosso

² University of the State of Mato Grosso

³ Me.

University of the State of Mato Grosso

⁴ Dr.

University of the State of Mato Grosso

⁵ Ma.

University of the State of Mato Grosso

⁶ Me.

University of the State of Mato Grosso

INTRODUCTION

Artificial intelligence is a field of computer science that focuses on the development of systems and machines capable of performing tasks that require human intelligence, which in short involves the ability of machines to learn, reason, understand, process natural language, and make decisions. In the field of accounting, these aspects can contribute to significantly change the way information is gathered and decisions are made (Schwindt; Costa, 2021).

These systems are programmed in order to guarantee patterns and information from a large set of data, enabling them to perform specific tasks in a completely autonomous way. It is believed that, given its substitutive function of human labor, the use of artificial intelligence will modify the entire current economic system (Silva et al., 2020).

In this context, the introduction of Artificial Intelligence in accounting can occur for the most varied purposes of this science. It ranges from tasks such as calculating taxes and identifying points of approach for auditing, to suggesting preventive actions based on behaviors or identifying calculation rules and automating office processes (Audaz, 2020).

However, this automation has not always been a recent process in accounting services. Activities such as cash flow and posting invoices already have software for data processing, optimizing accountants' time when working on repetitive and mechanical activities (BSSP, 2020).

While in decision-making, services are no longer elaborated in manual and/or technical activities. And efforts are now concentrated on analytical and strategic activities, for adequate decision support with the support of AI (Schwindt; Costa, 2021).

Given this, the research problem arises: What are the trends, gaps, and areas of prominence in scientific research on artificial intelligence in accounting, and how can this information guide future research and practices in the field?

And as an answer to the question presented, the work aimed to analyze the scientific production on Artificial Intelligence in Accounting. As specific objectives to analyze the following aspects: a) Stratify the scientific production on Artificial Intelligence in Accounting; and b) To identify trends, gaps and areas of prominence in scientific research; c) to identify the geographical distribution of productions on Artificial Intelligence in Accounting

The rationale for the research is based on the increasing integration of AI into accounting practices and the transformations that this technology is promoting in the field. Artificial Intelligence has the potential to automate repetitive tasks, improve data accuracy,

and enable more sophisticated analysis, which can increase the efficiency and effectiveness of accounting professionals. However, this evolution also raises critical questions about data protection, ethics, regulation, and the need for reskilling of professionals. Analyzing the scientific production on AI in accounting is important to understand the current state of research, identify gaps in knowledge, assess the impacts of emerging technologies, and guide future investigations.

THEORETICAL FRAMEWORK

ARTIFICIAL INTELLIGENCE (AI)

The term "Artificial Intelligence" was created in 1956 by scientist John McCarthy, who is also the creator of the Lisp programming language, which is widely used in the development of AIs (Pauleski, 2023). Today, AI ranges from virtual assistants on our devices to advanced data analysis algorithms in businesses.

According to Barbosa and Portes (2023, p. 17), Artificial Intelligence is defined as "the science and engineering of producing intelligent systems". This is an area of computer science that is dedicated to the construction of physical or digital mechanisms that simulate human thinking skills, rapidly transforming various aspects of society.

According to Pinho (2023), the term "artificial intelligence" is composed of two parts: "intelligence", which implies making rational decisions based on observational and situational analysis of situations, and "artificial", highlighting its artificial nature. In this way, AI can provide broader data analysis through advanced algorithms that make it possible to identify patterns and anomalies that would be difficult to detect manually, this helps in fraud prevention tasks and in making more informed and assertive financial decisions.

Artificial intelligence seeks to reproduce the reactions of the human mind, recognize speeches, thinking and learning from this it is possible to have intelligent recommendations about problems, and efficiency when locating, accessing and analyzing different types of data (Schwindt, 2020).

ARTIFICIAL INTELLIGENCE IN ACCOUNTING

AI makes it possible to streamline this process, properly assimilating legal language and analyzing thousands of decisions, adequately presenting the answer to the topic in question (BSSP, 2020). This transformation implies both challenges and opportunities, in the accounting field, the changes promoted by AI are mainly manifested in the automation

of routine tasks, the advanced analysis of complex financial data, and the prediction of future trends.

These technological advancements allow accountants to focus on more value-added activities, reducing the stress associated with repetitive tasks and the need for rework. In accounting sciences, the same phenomenon occurred, allowing activities to be affected by AI in order to obtain more efficiency and productivity (AUDAZ, 2020). Consequently, AI not only optimizes operational efficiency but also improves the quality of accounting work by minimizing errors and increasing the accuracy of financial analysis.

In this context, it is important to hold open and responsible debates on the expansion and deployment of AI, ensuring the maximization of its benefits and the mitigation of its possible risks. These principles encompass the data structures used in the generation of knowledge, the algorithms required to apply this knowledge, and the programming languages and techniques employed in its implementation (Luger, 2013, p. 21).

The use of this technology in accounting allows professionals to carry out their activities in a more analytical and decision-oriented way (BSSP, 2020). AI's ability to process large volumes of data quickly and efficiently makes it possible to identify patterns and anomalies more easily. Accounting is in the process of evolution along with Information Technologies, with the aim of supporting managers more efficiently. The demand for professionals with specialized AI skills in accounting is expected to increase as more businesses adopt these technologies to optimize their financial processes.

According to Moscové, Simkine and Bagranoff (2002), AI software used in business for accounting applications are expert systems that employ facts, knowledge and reasoning techniques to solve problems that require human skills. For O'Brien (2001), AI is becoming an integral part of technology in companies, designed to augment human capabilities and not to replace them. Today's AI technology enables a variety of applications that create connections between people, computers, knowledge, and the physical world.

Thus, the adoption of Artificial Intelligence, since its conception by John McCarthy (1956), has significantly transformed accounting, automating repetitive tasks and allowing more in-depth analysis of financial data. This results in increased efficiency and accuracy, allowing accountants to focus on strategic activities. However, the expansion of AI presents challenges in terms of data protection, regulation, and ethics, varying between countries. The evolution of accounting along with Information Technologies highlights the need for up-

to-date and trained professionals to maximize the benefits of AI, which expands human capabilities and creates new forms of interaction in the globalized business environment.

METHODOLOGICAL PROCEDURES

This is a bibliometric research focused on analyzing the characteristics of scientific production on the topic of Artificial Intelligence in Accounting until 2024.

Guedes and Borschiver (2005, p. 15) define bibliometrics as being:

A statistical tool that allows mapping and generating different indicators of treatment and management of information and knowledge, especially in scientific and technological information and communication systems, and productivity, necessary for the planning, evaluation and management of science and technology, of a given scientific community or country.

To carry out the research, the Web of Science database was used, which provides us with a variety of reviewed articles. Still following the research, the following keywords in English were used to search the results: "artificial intelligence" (Title) AND "accounting" (Title).

To have a more comprehensive understanding of artificial intelligence and accounting, it was discovered that the main journal first included in the Web of Science was in 1989. Therefore, the research period of the article was determined from January 1, 1989 to May 15, 2024, and a set of 71 documents was obtained for bibliometric analysis, which were exported as plain text files in TXT and CSV formats.

For data analysis, Microsoft Excel and VOSviewer software were used, for bibliometric analysis, VOSviewer is a tool specialized in visualizing citation and collaboration network diagrams, in addition to quantitatively analyzing bibliometric data, with a main focus on networks of scientific publications. VOSviewer is an advanced data analysis and management technique, increasingly in demand in various disciplines due to the introduction of smart technologies and the growth of "big data" (Raj; Singh; Singh, 2024).

The results of the data analysis were presented through graphs, tables and figures from Excel and VOSviewer. Visualizing keyword and author networks using tools such as VOSviewer helps to map the areas of greatest focus and emerging opportunities for the application of AI in the different accounting subdisciplines.

Co-occurrence analysis is a methodology used to reveal the degree of association between keywords, analyzing their frequency and relevance of co-occurrence. In this study,

a co-occurrence analysis was performed on 71 research articles related to artificial intelligence (AI). After cleaning the data and merging similar terms, a total of 272 keywords were identified.

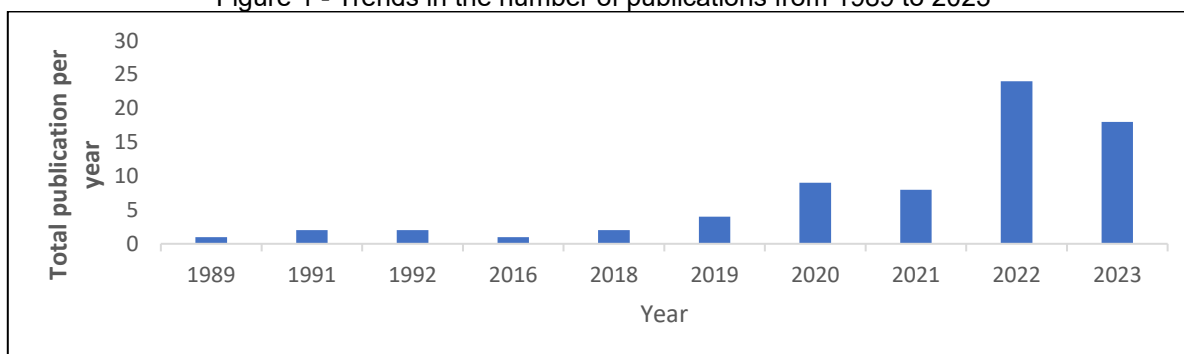
In the VOSviewer software, the "little ball" that appears connected to others through lines is called a "node" or "node". Nodes represent items such as articles, authors, or journals in a network of citations or co-citations. That is, in a network analysis, nodes represent distinct entities, such as keywords, authors, documents, institutions, or any other object of interest that is being studied (Waltman; Eck, 2023). The lines that connect the nodes are called "edges" and represent the relationships or connections between these items, such as citations or co-citations. Node colors often indicate different clusters or groups of items that are more strongly connected to each other.

For the aforementioned authors, in a network of co-authorship of scientific articles, each author would be represented by a node. In a keyword co-occurrence network, each keyword would be a node. Similarly, in a network of document cocitations, each document would be a node. The nodes are connected through links, which represent the relationships between these entities. The analysis of the connections between nodes allows the identification of patterns, communities, and structures in the network, providing valuable insights into the interaction and interdependence of the elements studied.

RESULTS AND DISCUSSION

As for annual publication trends, the analysis of the results of the bibliometric search on scientific production in Artificial Intelligence in accounting over time reveals a growth in publications, especially in the last decade. Figure 1 shows that, until 2018, production was sporadic, representing only 11.3% of the total publications. A slight increase is observed in 2019, followed by a clear upward trend from 2020 onwards. This increase highlights the growing academic interest in the application of AI in accounting, driven by technological evolution and the need for innovation in accounting practices. Although there was a slight decline in 2021, production continued at high levels, indicating the topic's persistent relevance in scientific research.

Figure 1 - Trends in the number of publications from 1989 to 2023

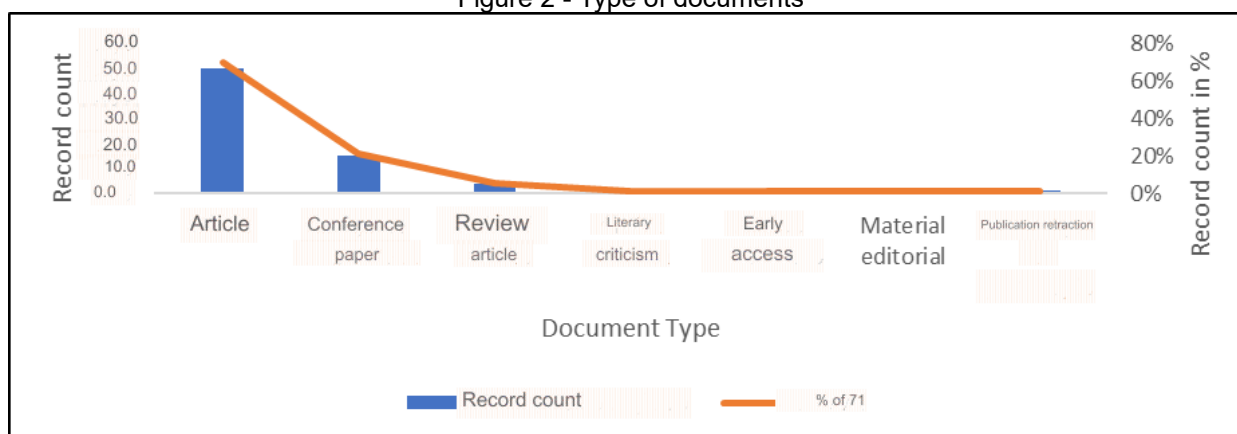


Source: Author (2024).

As for the types of documents on Artificial Intelligence in accounting (Figure 2), the study reveals that most publications are composed of research articles, which represent 70% (50 out of 71) of the total. This is followed by conference papers, with 21% (15 of 71), indicating the relevance of discussions at academic events for the dissemination of new knowledge. Review articles constitute 6% (4 of 71), reflecting efforts to synthesize and evaluate the existing literature.

Other types of documents, such as literary criticism, early access, editorial material, and retraction of publication, each account for 1% of the total (1 of 71), highlighting the diversity, albeit limited, of publication formats in this field of study. This distribution suggests that original research and presentation at conferences are the main vehicles for scientific dissemination in the area.

Figure 2 - Type of documents



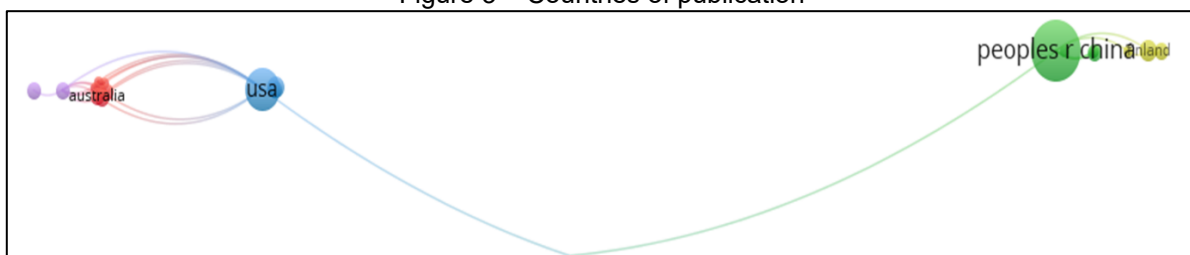
Source: Author (2024).

Using the VOSviewer software, the study showed the countries of publication in 5 clusters as shown in Figure 3: cluster 1 includes Australia, Belgium, Canada, Germany, New Zealand, Norway and Taiwan. In cluster 2 are Jordan, Pakistan, Peoples of China,

Saudi Saldita and Vietnam. In cluster 3 are Brazil, France and the United States of America. In cluster 4 are Austria, Finland, and Wales. In cluster 5 are the Netherlands and Poland.

Looking at Figure 3, it can be seen that countries such as the US and China lead in terms of production, while interconnectivity is especially strong between some European and Asian countries. The results highlight the need for greater international collaboration for countries with lower visibility and impact, aiming to increase their influence in the global scientific community.

Figure 3 – Countries of publication

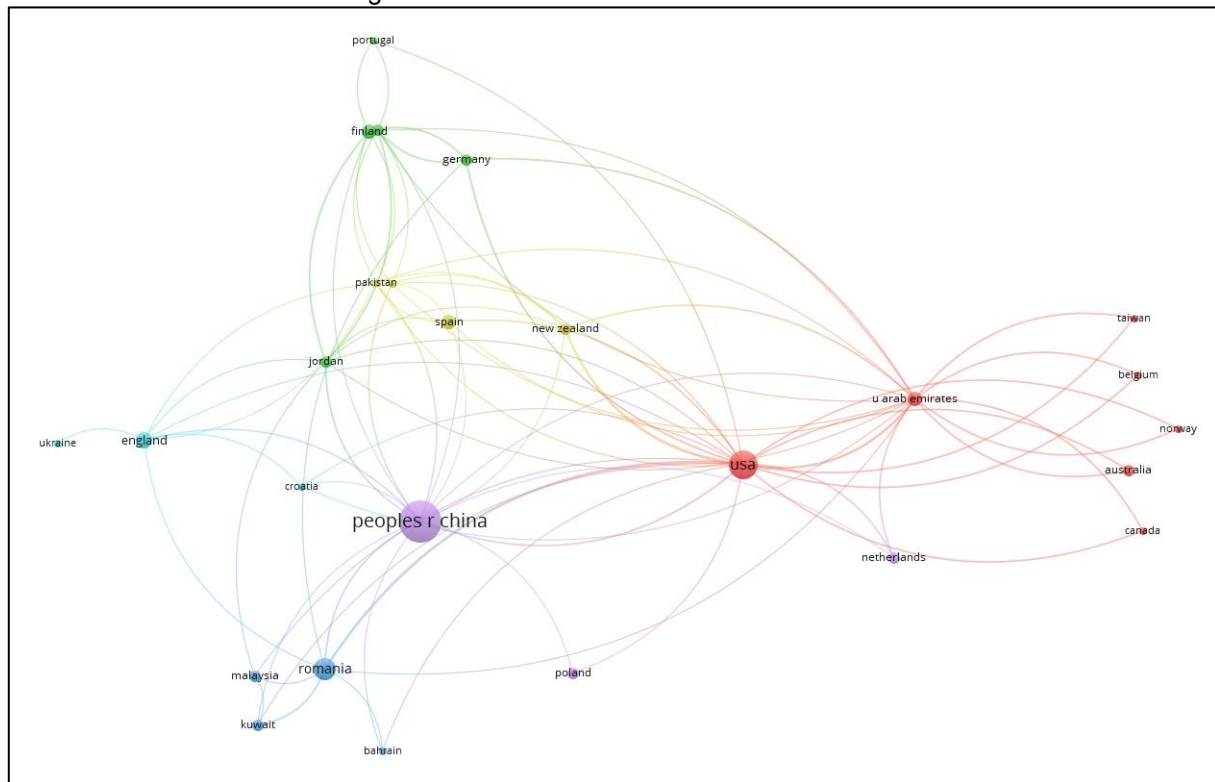


Source: Author (2024).

Figure 4 represents the citation network between the countries analyzed, the way in which the countries are interconnected with each other. The analysis reveals several important aspects about the distribution and influence of scientific publications originating from different countries:

In terms of number of documents, China is the country with the highest number of documents (25), followed by the USA (12) and Romania (7); Most of the countries on the list have only 1 or 2 documents. As for the number of citations, the U.S. has the highest number (199), suggesting a high influence and visibility of its publications. China (87) and the United Arab Emirates (66) also have a significant number of citations. Countries such as Brazil, Bahrain, Croatia, Pakistan, Portugal, Saudi Arabia and Vietnam have documents that have not received citations.

Figure 4 - Citation network between countries



Source: Author (2024).

Table 1 represents the ranking of the countries with the highest number of documents published, cited and that had a total greater strength of the links. According to Eck and Waltman (2023), the "Total Link Strength" (TLS) is a measure that indicates the strength of the connection between two nodes in the network of co-occurrences, co-authorships, co-citations, or bibliographic coupling. Each node in the network represents an item such as a keyword, author, or document, and the lines (links) between the nodes represent the relationships between them. The "TLF" is calculated based on the number of times the items are associated, it is a measure of the intensity of citation connections between countries.

USA (10), Netherlands (9), Australia, Germany, New Zealand, Belgium, Canada, Norway, and Taiwan (all with 8) have a high total link strength, indicating strong citation interconnectivity. Countries such as Brazil, the United Arab Emirates, Malaysia, Poland, Vietnam, and Ukraine have low TLS (1 or 0), suggesting lower citation interconnectivity. While China has the largest number of documents, the U.S. shows a greater influence in terms of citations. This may reflect the quality or impact of the published works.

As for interconnectivity between countries, the USA, the Netherlands, Germany, New Zealand, Belgium, Canada, Norway and Taiwan demonstrate strong interconnectivity of

citations. This strong interconnectedness suggests more intense scientific collaboration and meaningful mutual recognition between these countries. Some countries with a relatively low number of documents have a high total link strength (e.g., Australia and Germany), indicating that despite fewer publications, they are well connected and frequently cited by other works.

Countries such as Brazil and the United Arab Emirates, although they have contributed with some documents, have a low total link strength and, in the case of Brazil, zero citations, pointing to a lower visibility or impact.

Table 1 - Ranking of the countries with the highest number of documents

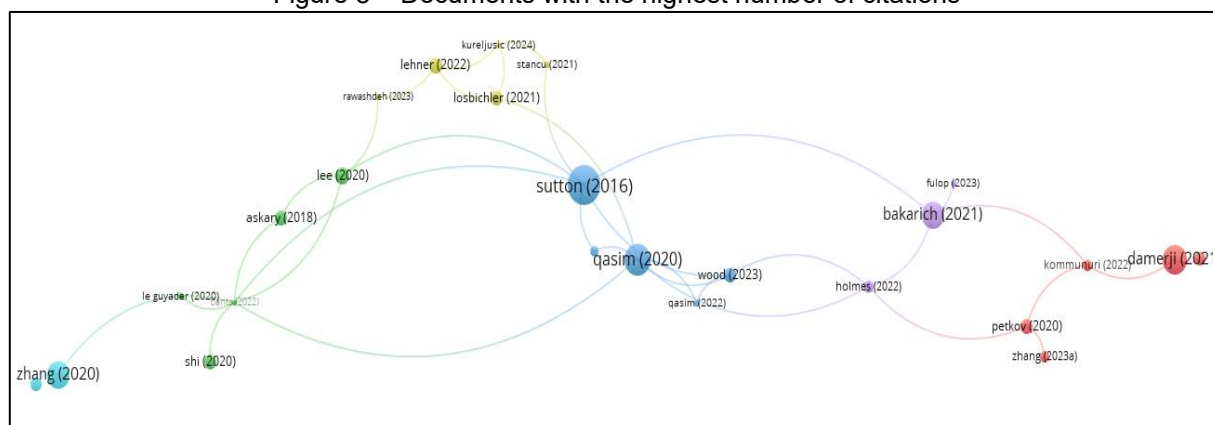
N	COUNTRIES	N. DOCUMENTOS	QUOTES	TOTAL LINK STRENGTH
1	Peoples R China	25	87	7
2	Usa	12	199	10
3	Romania	7	20	2
4	England	4	56	4
5	Brazil	3	0	1
6	Finland	3	26	4
7	Spain	3	10	3
8	U Arab Emirates	3	66	1
9	Australia	2	12	8
10	Austria	2	25	2
11	France	2	2	2
12	Germany	2	13	8
13	Jordan	2	1	3
14	Kuwait	2	12	2
15	Malaysia	2	16	0
16	Netherlands	2	21	9
17	New Zealand	2	18	8
18	Poland	2	10	1
19	Bahrain	1	0	2
20	Belgium	1	11	8
21	Canada	1	11	8
22	Croatia	1	0	0
23	Greece	1	1	2
24	Italy	1	1	2
25	Norway	1	11	8
26	Pakistan	1	0	3
27	Portugal	1	0	0
28	Saudi Arabia	1	0	3
29	Taiwan	1	11	8
30	Ukraine	1	2	0
31	Vietnam	1	0	1
32	Wales	1	1	2

Source: Author (2024).

The documents with the highest number of citations were represented visually, as illustrated in Figure 5. Among the main ones, the study by Sutton, Holt and Arnold (2016)

with the title "The reports of my death are greatly exaggerated" - Research on artificial intelligence in accounting (78 citations); study by Qasim and Kharbat (2020) entitled Blockchain Technology, Enterprise Data Analytics, and Artificial Intelligence: Use in the Accounting Profession and Ideas for Inclusion in the Accounting Curriculum (52 citations); and Han, Shiwakoti, and Botchie (2023) with the theme Accounting and auditing with blockchain technology and artificial intelligence: A literature review, published (44 citations).

Figure 5 – Documents with the highest number of citations



Source: Author (2024).

For further analysis, of the 71 reference documents examined in the study, they accumulated a number of citations greater than 10. Table 2 provides a more detailed view of the most cited documents on artificial intelligence (AI) in accounting, including information on authors, titles, journals, countries of origin, and number of associated citations, shown in Table 2.

The journals with the highest number of publications cited include the Journal Of Emerging Technologies In Accounting, the International Journal Of Accounting Information Systems; and conference papers and other publications include: the International Conference on Cyber Security Intelligence and Analytics (CSIA) and the 3rd International Conference on Cloud and Big Data Computing (ICCBDC).

Table 2 – Most cited reference documents on artificial intelligence in accounting

Author/Year	Title	Magazine	Country	Number of Citations
Sutton; Holt, and Arnold (2016)	The reports of my death are greatly exaggerated"-Artificial intelligence research in accounting	International Journal Of Accounting Information Systems	United States of America	78

Qasim, and Kharbat (2020)	Blockchain Technology, Business Data Analytics, and Artificial Intelligence: Use in the Accounting Profession and Ideas for Inclusion into the Accounting Curriculum	Journal Of Emerging Technologies In Accounting	United States of America	52
Hahn; Shivakoti; A Batchi (2023)	Accounting and auditing with blockchain technology and artificial Intelligence: A literature review	International Journal Of Accounting Information Systems	United States of America	44
Damerji and Salimi (2021)	Mediating effect of use perceptions on technology readiness and adoption of artificial intelligence in accounting	Accounting Education	United States of America	43
Zhang; Xiong, e Gu (2020)	The Impact of Artificial Intelligence and Blockchain on the Accounting Profession	IEEE Access	United States of America	39
Yvanich and O'Brien (2021)	The Robots are Coming ... But Aren't Here Yet: The Use of Artificial Intelligence Technologies in the Public Accounting Profession	Journal Of Emerging Technologies In Accounting	United States of America	38
Qiu (2022)	Analysis of Human Interactive Accounting Management Information Systems Based on Artificial Intelligence	Journal Of Global Information Management	United States of America	16
Lee and Tajudeen (2020)	Usage and Impact of Artificial Intelligence on Accounting: Evidence from Malaysian Organisations	Asian Journal Of Business And Accounting	Asian (Malasia)	16
Lehner, Ittonen, Wuhrlleitner, (2022)	Artificial intelligence based decision-making in accounting and auditing: ethical challenges and normative thinking	Accounting Auditing & Accountability Journal	United States of America	14
Petkov (2020)	Artificial Intelligence (AI) and the Accounting Function-A Revisit and a New Perspective for Developing Framework	Journal Of Emerging Technologies In Accounting	United States of America	12
Assyria; - Abu-Ghazaleh e Tahat (2018)	Artificial Intelligence and Reliability of Accounting Information	Challenges And Opportunities In The Digital Era	United States of America	12
Wood; Achhpilia; Sweet (2023)	The ChatGPT Artificial Intelligence Chatbot: How Well Does It Answer Accounting Assessment Questions?	Issues In Accounting Education	United States of America	11
Losbychler, A. Lehner (2021)	Limits of artificial intelligence in controlling and the ways forward: a call for future accounting research	Journal Of Applied Accounting Research	United States of America	11
Shi (2020)	The Impact of Artificial Intelligence on the Accounting Industry	International Conference on Cyber Security Intelligence and Analytics (CSIA)	United States of America	11
Face; Al Naqbi and Lootah (2019)	Integrated Cloud Financial Accounting Cycle. How Artificial Intelligence, Blockchain, and XBRL will Change the Accounting, Fiscal and Auditing Practices	3rd International Conference on Cloud and Big Data Computing (ICCBDC)	United States of America	11
Varzaru (2022)	Assessing Artificial Intelligence Technology Acceptance in Managerial Accounting	Electronics	United States of America	10

Gusc; Bosma; (...); Biernat-Jarka (2022)	The Big Data, Artificial Intelligence, and Blockchain in True Cost Accounting for Energy Transition in Europe	Energies	United States of America	10
O'LEARY (1991)	Artificial-Intelligence And Expert Systems In Accounting Databases - Survey And Extensions	Expert Systems With Applications 3	United States of America	10

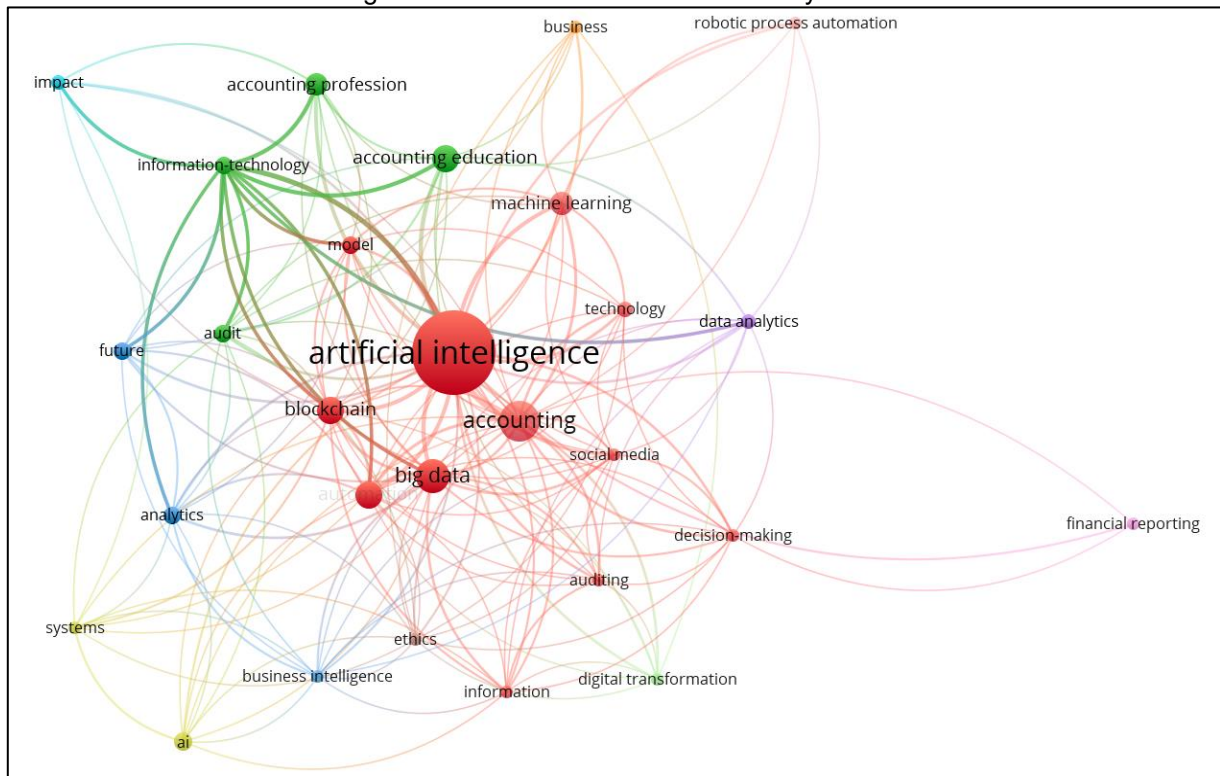
Source: Author (2024).

Based on the data presented in Table 2, there is a growing concern and interest in understanding, interpreting, and adapting to the changes caused by AI throughout its evolution. The implications of automated systems in everyday life, covering the domestic, professional and educational spheres, remain of high relevance. Technologies such as chatbots (used to interact with users through text or voice), with the ability to provide coherent answers and perform academic tasks, continue to impress due to their sophistication. The adoption of AI in companies and its effects on professionals, especially in the accounting sphere, arouse great interest and require continuous adaptation.

CO-OCCURRENCE ANALYSIS

Through the analysis of co-occurrence of the high-frequency keywords, this study aimed to understand the important topics, main concepts, and research trends in the field of AI. Figure 6 presents the analysis of the co-occurrence of the authors' keywords, in different colors, presented in 5 groups (clusters). Keywords with occurrences greater than three were selected, resulting in 28 keywords that meet this criterion out of a total of 272 keywords in the dataset. This approach allows you to identify the predominant focus areas and emerging themes, providing a comprehensive overview of research trends and core concepts in the AI literature.

Figure 6 - Co-occurrence of authors' keywords



Source: Author (2024).

Based on the grouping in Figure 6, the search directions and keyword groups for the five groupings are summarized in Table 3.

This approach allows you to identify the predominant focus areas and emerging themes, providing a comprehensive overview of research trends and core concepts in the AI literature.

Table 3 – Analysis of the co-occurrence of the authors' keywords.

Cluster	Research Direction	Keywords in each cluster (hits)	Number
1	Artificial intelligence	accounting education (8); accounting profession (6); artificial intelligence (44); data analytics (3); impact (3); information technology (4); machine learning (7); robotic process automation (3).	8
2	AI	Ai (5); analytics (4); audit (4); business intelligence (3); ethics (3); systems (3).	6
3	Accounting	Accounting (16); decision-making (3); financial reporting (3); social media (3); technology (4).	5
4	Big data	Automation (8); big data (11); blockchain (8); future (4); model (4).	5
5	Auditing	Auditing (3); business (3); digital transformation (3); information (3).	4

Source: Author (2024).

The analysis of co-occurrence of the authors' keywords provided by Table 3, generated by the VOSviewer software, presents five main clusters that reflect different research directions in the field of accounting and associated technologies. Each cluster is defined by a set of keywords (nodes), with specific frequencies of occurrences, highlighting the predominant areas of interest among the researchers. The clusters represent the predominant focus areas: accounting education and the accounting profession, AI, accounting, big data, and auditing. This analysis has made it possible to identify emerging themes and research trends, offering insight into the most relevant research directions.

Cluster 1: Artificial Intelligence (Inteligência Artificial)

This cluster is the most extensive, containing eight distinct keywords with a total of 44 occurrences for "artificial intelligence", highlighting the significant emphasis on the use of artificial intelligence within the context of accounting. Other keywords such as "accounting education" (8 occurrences) and "accounting profession" (6 occurrences) indicate a concern about the impact of AI on accounting education and practice.

Terms such as "machine learning" (7 occurrences) and "robotic process automation" (3 occurrences) show interest in the specific technologies that support artificial intelligence. This cluster suggests research focused on how AI is revolutionizing accounting education and practice.

Cluster 2: AI (Artificial Intelligence)

This cluster, with six keywords, explores the use of AI in specific areas such as auditing and business intelligence. "Ai" appears with 5 hits, followed by "analytics" (4 hits) and "audit" (4 hits), indicating an intersection between AI and analytics auditing. The inclusion of "ethics" (3 occurrences) and "systems" (3 occurrences) shows a concern with the ethical implications and integration of AI systems. This cluster highlights the role of AI in enhancing auditing and business intelligence while maintaining ethical vigilance.

Cluster 3: Accounting

Focused on accounting itself, this cluster includes "accounting" with 16 occurrences, reflecting the core of accounting research. Terms such as "decision-making" (3 occurrences) and "financial reporting" (3 occurrences) show interest in how accounting informs business decisions and financial reporting. The presence of social media (3

occurrences) and technology (4 occurrences) suggests an analysis of how technologies and social networks influence accounting. This cluster emphasizes research into the impact of new technologies on traditional accounting practices.

Cluster 4: Big Data

With five keywords, this cluster highlights the role of big data in accounting. "Big data" appears with 11 occurrences, followed by "automation" (8 occurrences) and "blockchain" (8 occurrences), indicating a focus on accounting process automation and blockchain technology. Terms such as "future" (4 occurrences) and "model" (4 occurrences) suggest prospective research into how these technologies will shape the future of accounting. This cluster emphasizes the transformative impact of large amounts of data and blockchain on accounting.

Cluster 5: Auditing (auditoria)

This smaller, four-keyword cluster focuses on auditing and digital transformation. "Auditing" appears with 3 occurrences, along with "business" (3 occurrences) and "digital transformation" (3 occurrences), suggesting an interest in how digitalization is transforming auditing practice. The presence of "information" (3 occurrences) indicates the importance of information management in modern auditing. This cluster reflects a research directed at the impact of digital technologies on business auditing.

The articles analyzed in the five clusters address different aspects of technological integration in accounting, highlighting the importance of curricular changes to prepare future professionals for this new reality. Blockchain technology, for example, is investigated for its potential to improve transparency and trust in accounting, especially in AI-enabled audits. Quantitative studies reveal that the technological readiness of accounting students and their perception of the usefulness and ease of use of AI significantly influence the adoption of these technologies.

In addition, the computerization of accounting, using AI-based expert systems, is seen as a means of improving the analysis of accounting information and decision-making. The adoption of AI-based accounting software, as observed in organizations in Malaysia, reinforces the need for comprehensive knowledge about these technologies in the era of industrial revolution 4.0.

The ethical challenges of using AI-based accounting systems are also discussed, using theoretical models to assess ethical decision-making. The current ability of accounting functions to accommodate AI is revisited, showing substantive examples of how AI can be integrated effectively.

AI, together with internal control systems, improves the quality of accounting information and reduces risks, contributing to the reduction of costs and losses, improving the performance of companies. The use of chatbots such as ChatGPT in accounting education and research is another area of interest, evidencing the ability of these tools to answer complex questions and provide educational support.

Studies on the limits and future applications of AI in accounting propose research agendas that deepen the field, considering the integration of cloud technologies and expert systems at all stages of the accounting cycle. The implementation of AI solutions in management accounting offers multiple advantages, such as innovation and improvement in the use of accounting information, in addition to being relatively easy to use

Other articles explore the practical application of these technologies, such as robotic process automation (RPA) and machine learning (ML), which are increasingly being used in public accounting. Accountants' receptivity to these innovations is high, and there is an expectation that these technologies will impact the daily responsibilities of professionals in the coming years.

FINAL CONSIDERATIONS

The bibliometric analysis carried out in this research offers a comprehensive and detailed view of the geographical distribution of scientific publications related to the application of Artificial Intelligence (AI) in accounting. The trend in scientific production over the last decade reflects technological evolution and the growing demand for innovation in accounting practices. The academic and professional interest in AI integration is evidenced by the increase in the frequency of publications from 2019 onwards.

Countries such as the United States and China have emerged as leaders in terms of the number of publications and citations, respectively, confirming that because they are pioneers in technology and have advanced technology parks, they are ahead in identifying needs and finding solutions for accounting. Interconnectivity is especially strong between some European and Asian countries, suggesting significant scientific collaboration between these countries.

The predominant documents are research and conference papers, indicating that original research and discussions at academic events are the main means of disseminating knowledge in the area. The presence of review articles also highlights efforts to synthesize and evaluate existing literature, contributing to a deeper understanding of the field.

The studies address various aspects of technological integration in accounting, highlighting the importance of curricular changes to prepare future professionals. Technologies such as blockchain and robotic process automation (RPA) are investigated for their potential to improve transparency and efficiency in accounting. In addition, the ethical challenges and future applications of AI are discussed, including its implementation in management accounting and sustainable energy production. The challenges in the application of big data, AI and blockchain for sustainable energy production are discussed, contributing to the literature by identifying barriers and enablers in this context.

Although the analysis was performed on a specific database, it is important to consider that it may not include all relevant studies. Future research can expand the databases and the set of keywords used in the analysis to obtain a more comprehensive view of the field. Incorporating terms such as "Artificial Intelligence," "Expert Systems," "Knowledge-Based Systems," "Machine Learning," and "Accounting" can provide a more comprehensive and detailed view of the field. The inclusion of these keywords will allow you to capture a wider range of literature and identify critical intersections between different areas of study.

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