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Research on the implication of artificial intelligence in accounting subfields: current research trends from bibliometric analysis, and research directions

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Abstract

All stakeholders recognize the importance of the information provided by various accounting subfields in the decision-making process and managerial activities, on the other hand, with the exponential growth of artificial intelligence, the traditional way of working in accounting has changed, and research about it has been undertaken worldwide, In this context, This study provides a bibliometric analysis of 931 articles which were published from 1990 to 2022 to look for the research trends and most prominent topics and theme addressed in the literature regarding the application of artificial intelligence technologies in five accounting subfields namely Financial Accounting, Management Accounting, Tax Accounting, Auditing, and Governmental Accounting.

Using VOS viewer software, this study contributes to accounting literature by analyzing the current common theme in the literature through visualizing and mapping the occurrence and the co-occurrence of authors' keywords of 931 articles that address this topic, which will allow us to highlight some less explored avenues of research that can therefore be further explored by scholars. The results show that Financial Accounting is the most commonly researched accounting area explored. The theme most frequently addressed is the detection of financial statement fraud. There were few articles discussing Artificial Intelligence's implication on Tax Accounting and Government Accounting. Further, the study provided six major areas that have been revealed for future research on this topic: the implication of the Internet of Things, Blockchain and Big Data and the Accounting field, Accounting cybersecurity in the artificial intelligence area, XBRL, and Artificial Intelligence in Accounting.

Keywords: Bibliometric, Accounting subfields, Artificial Intelligence, Vosviewer.
JEL Classification: M4, Q55
Paper type: Theoretical Research

1. Introduction

Accounting is an information and measurement system that identifies, records, and communicates relevant, reliable, and comparable information about an organization's business activities (John, J. 2011). The information accounting provides called "accounting information" serves internal stakeholders such as corporate managers and external stakeholders such as shareholders, creditors, banks, and tax authorities, in the decision-making process Buljubaˇsi´c & Ilgn (2015). It is thus important to distinguish between various types of accounting information depending on which subfields of accounting it comes from, and to which users it is addressed, the main source of accounting information are Financial Accounting, Management Accounting, and Tax Accounting. On the other hand, during the past decade, disruptive Technologies such as Artificial Intelligence have seen rapid growth in almost every field and gradually penetrate the accounting Field (Yadav, S. 2021, Guomin, S. 2019). The positive side of the availability of data information makes the accounting field suitable for Artificial Intelligence because is the main way to apply Artificial Intelligence (Wu, X. 2021).

Over the years, several articles discussed and reviewed AI's impact on different aspects of the accounting field and business in general, for example, the literature reviews by (Zhang et al. 2020, Zemánková, A. 2019(a), Moll & Yigitbasioglu. 2019, Zemankova, A. 2019 (b), and Lehner et al. 2022) provided a comprehensive review of the integration of artificial intelligence and other disruptive technology such as blockchain in the accounting field. Additionally, (Atayah & Alshater,2021) used bibliometric and content analysis to analyze 154 relevant English articles published in Scopus related to Audit and tax in the context of emerging technologies, including big data, blockchain, and artificial intelligence, a panel systematic approach was conducted by (Mardini & Alkurdi, 2021) to evaluate the overall state of this topic and identify relations and gaps and inconsistencies in the literature on AI and accounting. Despite the existence of other literature reviews, our understanding implication of artificial intelligence in each accounting branch remains fewer, to fill this gap our study is one of the very first studies, to our knowledge, that aims to specifically provide a unified overview of the literature regarding the application of AI in multiple accounting subfields namely Financial Accounting, Management Accounting, Tax Accounting, Auditing, Governmental Accounting, to do so, we conducted a bibliometric analysis using VOS viewer software to analyze 931 articles retrieved from SCOPUS database from 1990 to 2022. Thus, this study addresses the following research questions (RQs): What are the prominent topics and themes that have been explored regarding the implication of Artificial Intelligence in five subfields of accounting namely: Financial Accounting, Management Accounting, Tax Accounting, Auditing, and Governmental Accounting? What are the future research avenues related to Artificial Intelligence and the five subfields of accounting mentioned above?

This study contributes to the accounting literature, Firstly, this article takes into consideration different subfields of accounting in order to obtain an integrated overview of the most prominent topics and themes addressed. Secondly, this article highlights research directions that we believe will be a useful resource for researchers who are studying or planning to explore these topics.

This paper is structured as follows: After a general introduction to accounting and artificial intelligence, and the related research to position the contribution of this work, section 2 presents theories related to Accounting Information, afterward in section 3 discusses the used methodology and research questions. we present the output of the bibliometric analysis with a discussion of the main findings for each Accounting subfield in section 4; section 5 outlines future research directions. Some conclusions are provided in section 6.

2. Theoretical Background

Accounting information has generally been based on contingency and agency theories, because accounting information systems depend on contingent factors, such as rapid technological change and digitization, and the effects of accounting information systems will be influenced by the interests of the different actors (manager-owners-shareholders) (Monteiro & Cepêda, 2021).

2.1 Contingency Theory

The contingency theory has been widely accepted and used in management and accounting literature (Ismail et al., 2010). in contingency theory, the external environment has been one of the pillars for the evolution and implementation of Accounting Information Systems In the context of management accounting, contingency theory is based on the premise that there is no universally appropriate accounting system that applies equally to all organizations in all circumstances (Otley, D. 1980). In the context of financial accounting, (Saudagaran and Diga, 1999) postulated that financial accounting systems are related, on a contingent basis, to particular environmental variables; namely, political, economic and socio-cultural. in contingency theory.

2.2 Agency Theory

Tiessen & Waterhouse (1983) revealed that the agency theory examines an organization as though it represented a situation where one or more persons [the principal(s)] engage another person or persons [the agent(s)] to perform some service on their behalf. Jensen & Meckling (2019) explained that one of the responsibilities of an agent is to give information related to business to shareholders. The conflict can happen if both part act individually to maximize its interest. This conflict happens because of information asymmetry. Information asymmetry happens because of manager has more information than the stakeholders. the stakeholders usually do not know a company's real financial condition until financial distress occurs (Jan, C. L. 2021).

3. Research Methodology

This study is conducted using bibliometric analysis. We can explain our choice by the popularity of this type of review in business research and its advancement Donthu et al. (2021). Essentially, bibliometric analysis is a scientific method that uses quantitative techniques on bibliographic data in order to analyze a body of literature (Donthu et al., 2021), in the present study we follow the four-step procedure recommended by (Donthu et al. 2021) for bibliometric reviews: (1) defining the aims and scope for review; (2) choosing the techniques for analysis; (3) collecting the data for analysis; and (4) conducting the analysis and reporting the finding.

3.1 Define the aims and scope of the bibliometric study

This study aims to identify and analyze the prominent topics and themes, and secondly present and discuss future research avenues of the literature on the implication of AI in Accounting subfields.
In this article, we will respond to the following research questions: What are the prominent topics and themes that have been explored regarding the implication of Artificial Intelligence in five subfields of accounting namely: Financial Accounting, Management Accounting, Tax Accounting, Auditing, and Governmental Accounting? What are the future research avenues related to Artificial Intelligence and five subfields of accounting namely: Financial Accounting, Management Accounting, Tax Accounting, Auditing, and Governmental Accounting?

3.2 Choosing the techniques for analysis

To meet the aims and scope of the study in the first step, the prominent topics and themes for each four accounting subfields are addressed through a science mapping technique specifically co-word analysis derived from "author keywords", we used this technique because Co-word analysis considers that words that occur frequently together have a thematic connection with each other (Donthu et al., 2021).

3.3 Collecting data for analysis

To gather the data required for the selected bibliometric analysis techniques in the second step, we first need to define the search terms that will generate research results that are large enough to justify a bibliometric analysis but targeted sufficiently to remain within the research topic, As mentioned, the analysis of the prominent topics and themes is conducted through Co-Word analysis for each of the four accounting subfields, thus, the authors searched firstly for alternative terms for each corresponding accounting subfields and secondly for the most common technologies of artificial intelligence.

We selected The Scopus database to search for literature, giving it the largest database, afterward, we performed the search for articles using an advanced search for which alternative terms of the corresponding accounting subfields appear simultaneously with the most common AI applications in the title, abstract and keywords to match our query. Table 1 represents the research design for this study.

3.4 Conducting the Analysis and Reporting the Finding

The latest step is to run the bibliometric analysis and report the findings. The application of bibliometric analysis is often combined with network visualization software (Donthu et al., 2021), To perform a bibliometric analysis and visualize its results in a network visualization the authors use VOSviewer (Van Eck & Waltman, 2010).

Following our queries search, the Scopus output sum contains 3317 documents, on august 26, 2022, to specify the result on the most relevant articles regarding our research questions, we excluded articles written in languages other than English, and we then started the screening process by examining the title, keywords, and abstracts of selected articles; in sum 931 articles were considered relevant for our study, respectively 443 articles for Financial Accounting, 56 articles for Management Accounting, 73 articles for Tax accounting, 348 articles for Auditing, finally, 7 articles were included for Government Accounting. 2296 articles were excluded due to their non-compliant with the aim of this study and 90 were in a language other than English we exported a file listing information about the selected articles such as authors, document title, year, source, abstract, keywords, etc. We then used this data as input for VOSviewer (van Eck & Waltman, 2010) for network visualization.

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Table 1: Articles identification and screening process

Accounting subfields	Alternative terms used Simultaneously with Artificial Intelligence	most common of AI applications	Scopus output	Articles excluded		Selected Articles for the analysis
				in a language other than English	After Content Screening	
Financial Accounting	"Financial Accounting" OR "Financial Statement" OR "Financial Reporting" OR "Financial Reports" OR "Bookkeeping" OR "Financial Information"	"Artificial Intelligence" OR "Machine Learning" OR "deep Learning" OR" neural networks" OR "Data Mining" OR "Robots" OR "Optical Character Recognition" OR "Natural Language Processing" OR "expert system"	780	17	320	443
Management Accounting	"Analytical Accounting"		106	05	45	56
Tax accounting	"Fiscal", "Taxation"		383	13	297	73
Auditing	"Audit" OR "auditor" OR "audit risk" OR " "internal control" OR "audit judgment task" OR "Audit Opinion" OR " detection of fraudulent financial statement" OR "Audit Risk Assessment"		2,028	55	1625	348
Government Accounting	"Government Accounting" OR "Public Accounting"		27	1	15	11
Sum			3317	90	2296	931

Source: authors

4. Findings: Bibliometric Mapping/Visualization

To identify major themes in Artificial Intelligence and accounting subfields corpus, we use co-occurrence analysis of authors' keywords, co-occurrence analysis is conducted using author keywords (keywords that authors list in their articles). Goodell et al., (2021) assume that the publications sharing literature references share common themes as well.

4.1 Area 1: Artificial Intelligence and Financial Accounting

Accountancy comprises several sub-domains including financial accounting, taxation, auditing, and management accounting, (Sangster, A. 1994). Financial Accounting is a branch of accounting intended its purpose is to communicate information regarding the results of operations, the financial position, and the cash flows of an enterprise for users outside the business itself (Alexander& Nobes, 2007).

The bibliometric analysis is based on 993 authors' keywords, this analysis included author keywords that occur a minimum of five times in order to be included in the visualization, Vosviewer outcome is a network made of 41 Nodes, the node size is determined by the number of occurrences of the corresponding keyword. (Donthu et al., 2021).

The more keyword is mentioned, the bigger, therefore from 443 publications selected for analysis, we found that the keyword" Machine Learning" is the most occurring word (56), followed by Data Mining (53); Artificial Intelligence (34); neural network (24), financial statement Fraud (18); deep learning (1 7).

Figure 1: Our network visualization of the Occurrence and Co-occurrence of the author's keyword related to Artificial Intelligence and Financial Accounting
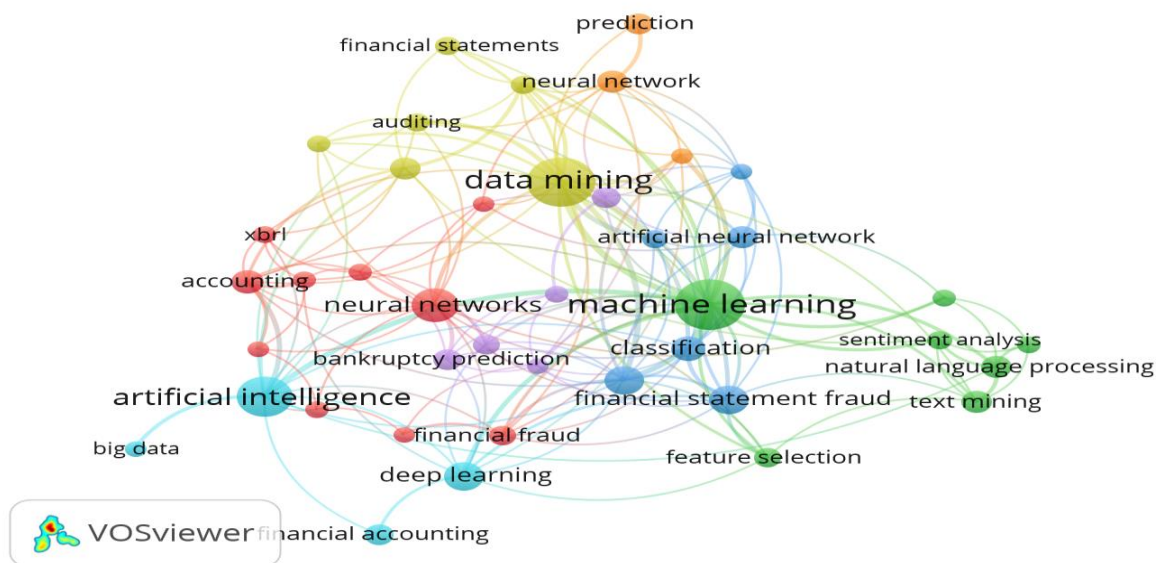
Source: authors

The final output, visualized in Figure 1, is ventilated in seven clusters with different colors, each color represents a thematic cluster, wherein the nodes and links in that cluster can be used to explain the cluster's coverage of topics and the relationships between the nodes manifesting under that cluster, thus, the prominent topics and themes related to artificial intelligence and Financial Accounting are as follows:

Clusters 1 and 4 (red/purple): The Prediction of Corporate Bankruptcy

the articles in this cluster concentrate on artificial intelligence technologies such as neural network (24) and expert systems (5), classification algorithms such as random forest (6), and decision tree (9), and their integration into the finance and accounting area such as forecasting (5), credit risk (6) and financial fraud (8) bankruptcy prediction (9), financial ratio (8), also XBRL (6) appear prominently in this cluster word cloud. Chen et al., (2009) extracted variables from financial and non-financial ratios in the financial statement and used artificial neural network (ANN) and data mining (DM) techniques to construct the financial distress prediction model, in order to find a better early-warning method, Similarly, Hosaka, T. (2019) used the financial statements (balance sheets and profit-and-loss statements) of 102 companies for training and testing a convolutional neural network to the prediction of corporate bankruptcy Cluster 2 (green): The studies in this cluster primarily deal with the topics related to the extraction of information (6) and natural language processing (10) to discriminate fraudulent financial statements from non-fraudulent financial statements. Humpherys, S. (2009) applied Natural Language Processing techniques to generate raw counts and usages rates of hedging devices, and a logistic regression-based classification model successfully discriminates with 69.3% accuracy

Clusters 3 and 4 (blue/yellow): Financial Statement Fraud Detection

The cluster's central theme was the use of the artificial neural network (11) and classification (13) model, and data mining (53) in financial statement fraud detection (18). Kirkos et al., (2007) tested the applicability of three Data Mining techniques in management fraud detection: Decision Trees, Neural Networks, and Bayesian Belief and their predictive accuracy, Similarly, Ravisankar et al., (2011) used data mining techniques such as Multilayer Feed Forward Neural Network (MLFF), Support Vector Machines (SVM), Genetic Programming (GP), Group Method of Data Handling (GMDH), Logistic Regression (LR), and Probabilistic Neural Network (PNN) to identify companies that resort to the financial statement.

Table 2: Five most-cited/relevant studies regarding the implication of Artificial Intelligence and Financial Accounting

| Author(s)	Title	Year	Cited by
Kirkos, E., Spathis, C., Manolopoulos, Y.	Data Mining techniques for the detection of fraudulent financial statements	2007	376
Ravisankar, P., Ravi, V., Raghava Rao, G., Bose, I.	Detection of financial statement fraud and feature selection using data mining techniques	2011	258
Lam, M.	Neural network techniques for financial performance prediction: Integrating fundamental and technical analysis	2004	237
Chen, W.-S., Du, Y.-K.	Using neural networks and data mining techniques for the financial distress prediction model	2009	156
Green, B.P., Choi, J.H.	Assessing the risk of management fraud through neural network technology	1997	156
De Andrés, J., Lorca, P., De Cos Juez, F.J., Sánchez-Lasheras, F.	Bankruptcy forecasting: A hybrid approach using fuzzy c-means clustering and multivariate adaptive regression splines (MARS)	2011	117

Source: authors

4.2 Area 2: Artificial Intelligence and Management Accounting

In contrast to financial accountants who prepare accounting information for external use, management accountants prepare accounting information for internal use Sangster. (1994). The bibliometric analysis is based on 120 authors' keywords, using 3 as a minimum number of occurrences. Vosviewer outcome, as visualized in Figure 2, is a network made of 8Nodes, ventilated in four thematic clusters with different colors, Overall," Management Accounting" is the most used keyword (14), followed by Artificial intelligence (12); "big data" (06). The prominent topics and themes related to artificial intelligence and Financial Accounting are as follows:

Figure 2: Our network visualization of the Occurrence and Co-occurrence of the author's keyword related to Artificial Intelligence and Management Accounting
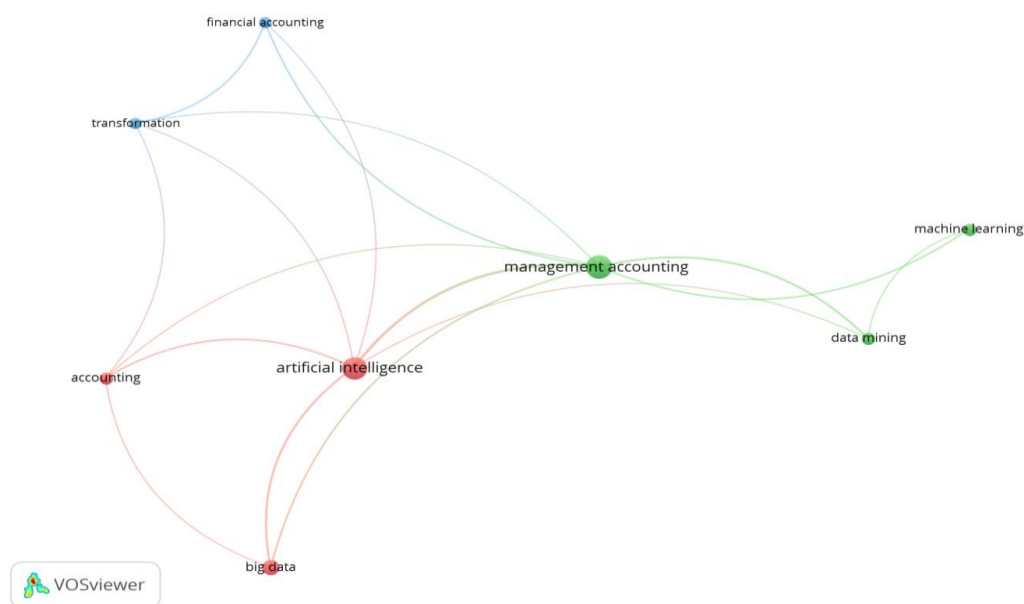
Source: authors

The prominent topics and themes related to artificial intelligence and Financial Accounting are as follows:

Cluster 1 (green): Data mining and Management Accounting

The themes of this cluster are related to the application of mainly machine learning (4) and data mining (4) in management accounting (14). Zhang, X. (2021) uses data mining technology and machine learning technology to construct a management accounting information system that covers modules such as accounting report management, the closed-loop risk management information system for risk, the performance management information system for performance evaluation, and the accounting decision support system for the decision maker. Ping, W. (2021) explains that data mining enhances the development of management accounting by providing support for decision-making through dealing with a large amount of information value, brought by big data in today's era, which is the main challenge of Management Accounting. Min, R. (2021) Also highlights that using data mining techniques in the management accounting field can achieve accurate and efficient information extraction of massive data.

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Cluster 2 (blue): Transformation from Financial Accounting to Management Accounting

The studies in this cluster primarily deal with the transformation (3) from financial accounting (3) to management accounting (14) under the artificial intelligence era (13). Liu et al. (2022), Cong, X. (2021), and Guo, X. (2019) highlight the inevitable transformation from financial accounting to management accounting among companies in the artificial intelligence era, Guo, X. (2019) explains that data processing in enterprise accounting has been completely automated, and manual work has been gradually replacing, in this context accountants should gradually change to management accounting.

Table 3: Five most-cited/relevant studies regarding the implication of Artificial Intelligence and Management Accounting

| Author(s)	Title	Year	Cited by
Jones, T.C., Dugdale, D.	The ABC bandwagon and the juggernaut of modernity	2002	188
Ionescu, L.	Robotic process automation, deep learning, and natural language processing in algorithmic data-driven accounting information systems	2020	14
Qiu, Y.L., Xiao, G.F.	Research on cost management optimization of financial sharing center based on RPA	2020	7
Spear, N.A., Leis, M.	Artificial neural networks and the accounting method choice in the oil and gas industry	1997	5
Sangster, A.	The adoption of IT in management accounting: The expert systems experience	1994	5
Zhang, X.	Application of data mining and machine learning in management accounting information system	2021	3
Ping, W.	Data mining and XBRL integration in management accounting information based on artificial intelligence	2021	2

Source: authors

4.3 Area 3: Artificial Intelligence and Tax Accounting

Tax Accounting is a sub-field of accounting that is concerned with the reporting of taxable income (Jordan, J. 1989). The bibliometric analysis is based on 221 authors' keywords, using 3, as the minimum number of occurrences. Vosviewer outcome as visualized in Figure 3, is a network made of 7 nodes, ventilated in tree thematic clusters with different colors
In the 73 publications selected for analysis, the keyword" Artificial intelligence" is the most used keyword (16) then followed by "data mining" (6);" big data" (5);

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Figure 3: Our network visualization of the Occurrence and Co-occurrence of the author's keyword related to Artificial Intelligence and Tax Accounting

<div align="right">

Source: authors

</div>
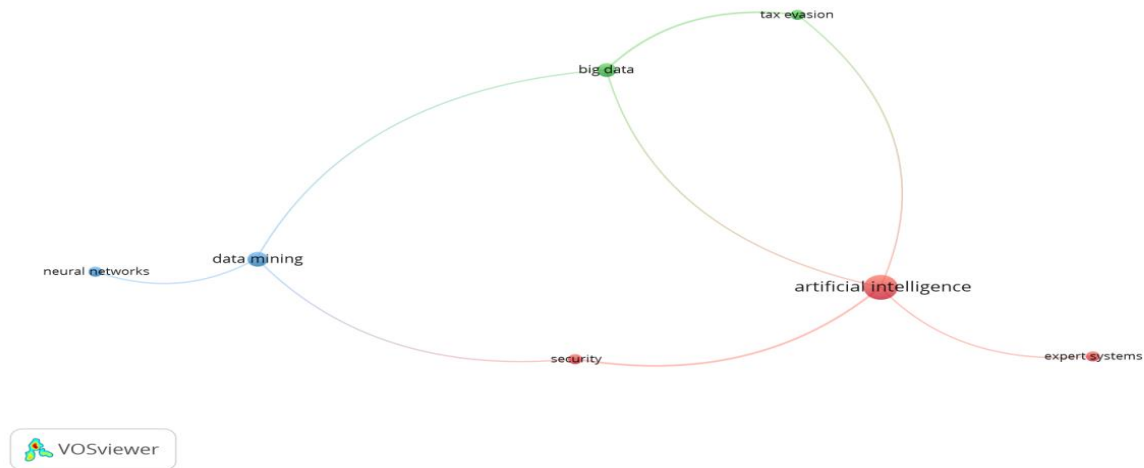
the prominent topics and themes related to artificial intelligence and Financial Accounting are as follows:

Cluster 1 (green): Tax Evasion

The cluster's central theme revolved around the use of artificial intelligence (16) in tax evasion (3). Tian et al., (2016) propose techniques for mining suspicious tax evasion through a colored network-based model (CNBM) in a two-phase process. The first phase is to discover the suspicious groups from the heterogeneous information network built based on the CNBM, in order to identify the suspicious trading relationships. The first phase is called mining suspicious groups. In the second phase, traditional methods can be used on all transactions related to suspicious trading relationships to detect tax evasion within the set of suspicious groups. The second phase is called identifying tax evasion.

Cluster 2 (red): Detection of fraudulent taxpayers

The studies in this cluster primarily deal with the topics related to the implication of data mining (3) and neural network (3) in the tax accounting era. The article by de Roux et al., (2018) proposed An unsupervised method to identify under-reporting tax declarations on spectral clustering. In López et al.,(2019) study, a neural network model was used to identify fraud in personal income tax forms, the authors verified that the Multilayer Perceptron is useful for the classification of 513 Future fraudulent and non-fraudulent taxpayers, Similarly, Chen et al.,(2011) developed an automatic detection model for discovering erroneous tax reports. The model uses several neural network variations, the results indicated that multilayer feedforward networks reached the upper 70% successful recognition rate.

Table 4: Five most-cited/relevant studies regarding the implication of Artificial Intelligence and tax accounting

| Author(s)	Title	Year	Cited by
Tian, F., Lan, T., Chao, K.-M., (...), Shah, N., Zhang, F.	Mining suspicious tax evasion groups in big data	2016	33
De Roux, D., Pérez, B., Moreno, A., Del Pilar Villamil, M., Figueroa, C.	Tax fraud detection for under-reporting declarations using an unsupervised machine learning approach	2018	29
López, C.P., Rodríguez, M.J.D., Santos, S.L.	Tax fraud detection through neural networks: An application using a sample of personal income taxpayers	2019	12
Chen, J.-H., Su, M.-C., Chen, C.-Y., Hsu, F.-H., Wu, C.-C.	Application of neural networks for detecting erroneous tax reports from construction companies	2011	10
Baldwin-Morgan, A.A.	Integrating artificial intelligence into the accounting curriculum	1995	9
Biryukov, A., Antonova, N.	Expert systems as the key tendency of artificial intelligence in tax administration	2019	7

Source: authors

4.4 Area 4: Artificial Intelligence and Auditing

Rick, H. (1999) defines an audit as a systematic process of objectively obtaining and evaluating evidence regarding assertions about economic actions and events to ascertain the degree of correspondence between these assertions and established criteria, and communicate the results to interested users. The bibliometric analysis is based, on 761 authors' keywords, using 5 as the minimum number of occurrences. Vos viewer extracted 30 nodes; each node is a selected keyword that showed up at the tree five times,
– In the 348 publications selected for analysis, the keyword" Data mining" is the most used keyword (62) then followed by" Artificial Intelligence" (54); "auditing" (49); "Machine Learning" (40);

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Figure 4: Our network visualization of the Occurrence and Co-occurrence of the author's keyword related to Artificial Intelligence and Auditing
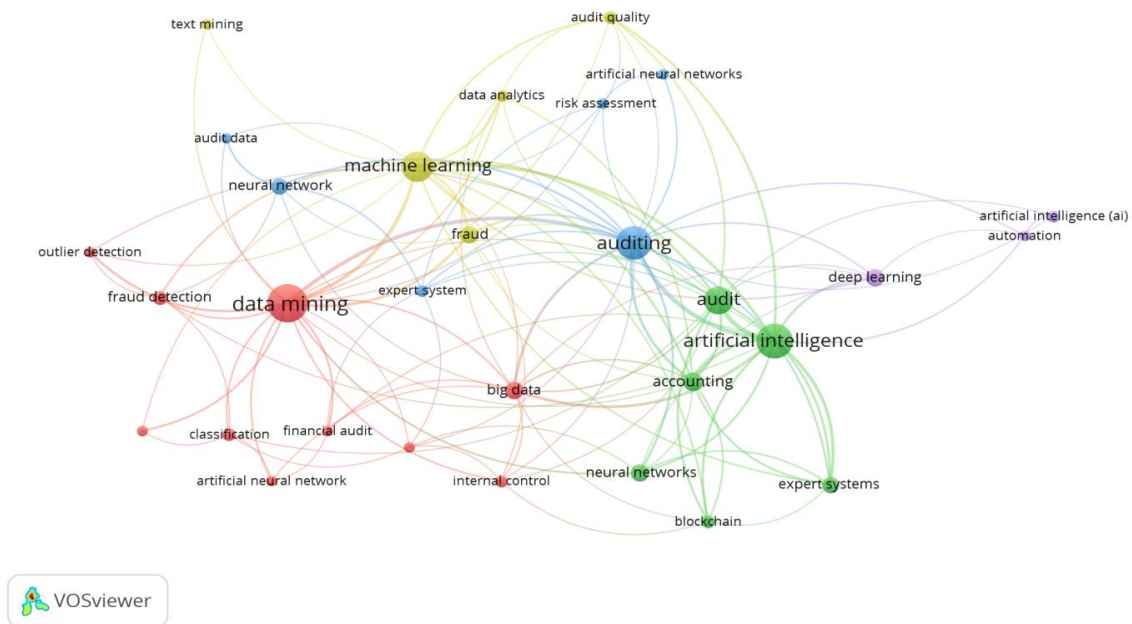
Source: authors

The final output, visualized in figure 5, is ventilated in five thematic clusters with different colors, the prominent topics, and themes related to artificial intelligence and Financial Accounting are as follows:

Cluster 1 (red): Financial Audit

 The themes of this cluster are related to the use of artificial neural networks (5) data mining (62) in fraud detection (9) and financial audit (5) outlier detection co-occurred (6) together with this concept. Debreceny and Gray, (2011) applied data mining methods for analyzing journal entries, Similarly, Werner and Gehrke, (2015) applied data mining techniques in financial audits, the algorithm integrates the control flow and data flow perspective to support and automate the audit of business processes.

Cluster 2 (yellow): Audit Quality

The studies in this cluster primarily deal with the topics related to the use of text mining (5) and machine learning (40) in fraud detection (13) and audit quality (7). Fisher et al. (2016) reviewed a large body of research regarding the applications of NLP in accounting and auditing and concluded NLP augmented by Machine learning has proven particularly useful in enhancing continuous auditing applications.

Cluster 3 (green): the application of expert systems and neural networks in auditing

The cluster's central theme was the use of artificial intelligence technology such as expert systems (14) and neural networks (13) and auditing, also blockchain (8), and audit co-occurred together as a subject area of interest. Zhang et al., (2021) develop a financial audit model using artificial neural network technology for auditors to use in the estimation of financial audit

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conditions, which can solve the problem of global analysis of financial audit data in the massive data volume.

Table 5: Five most-cited/relevant studies regarding the implication of Artificial Intelligence and tax accounting and Auditing

| Author(s)	Title	Year	Cited by
Fisher, I.E., Garnsey, M.R., Hughes, M.E.	Natural Language Processing in Accounting, Auditing, and Finance: A Synthesis of the Literature with a Roadmap for Future Research	2016	73
Debreceny, R.S., Gray, G.L.	Data mining journal entries for fraud detection: An exploratory study	2010	49
Werner, M., Gehrke, N.	Multilevel Process Mining for Financial Audits	2015	22
Bhattacharya, S., Xu, D., Kumar, K.	An ANN-based auditor decision support system using Benford's law	2010	22
Werner, M., Gehrke, N., Nüttgens, M.	Business process mining and reconstruction for financial audits	2012	18
Xinman, Z.	Construction of financial auditing teaching mode based on artificial intelligence expert system	2017	7

Source: authors

4.5 Area 5: Artificial Intelligence and Government Accounting

Governmental accounting is the managing and budgeting of public revenue. The bibliometric analysis is based, on 96 indexes and authors' keywords, using 2 as the minimum number of occurrences. Vos viewer extracted 6 nodes, In the 11 publications selected for analysis, the keyword" expert system" is the main keyword used (6).

The final output, visualized in figure 5, is ventilated in two thematic clusters with different colors, the prominent topics, and themes related to artificial intelligence and Financial Accounting are as follows:

Figure 5: Our network visualization of the Occurrence and Co-occurrence of the author's keyword related to Artificial Intelligence and Government Accounting
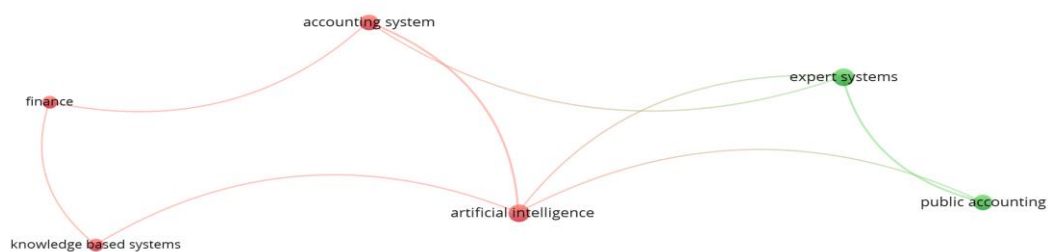
Source: authors

Cluster 1 (green): the application of expert systems in public accounting

The cluster's central theme revolved around the use of expert systems in public accounting (3). Alfian, A. (2017) focused his study on what problems can be solved by Expert system application in the Indonesian governmental accounting system and found 17 problems in 3 accounting domains in central government, and region government such as Potential uncollectible receivables, Insufficient evaluation of budget formulation and Insufficient procurement of supply necessities could be solved with Expert system application.

Table 6. Five most-cited studies in the "Artificial Intelligence and Government Accounting topic

Author(s)	Title	Year	Cited by
Mosteanu, N.R., Faccia, A.	Digital systems and new challenges of financial management – fintech, XBRL, blockchain, and cryptocurrencies	2020	42
Kasy, M.	Optimal taxation and insurance using machine learning — Sufficient statistics and beyond	2018	5
Khtira, R., Elasri, B., Rhanoui, M.	From data to big data: Moroccan public sector	2007	3
Li, J.	Government accounting optimization based on computational linguistics	2019	1
Alfian, A.	The Development Framework of Expert System Application on Indonesian Governmental Accounting System	2017	1
Beckman, Thomas J.	Assistant expert system: assisting assistors in assisting taxpayers.	1989	1

Source: authors

5. Suggestions for future research directions

The rapid development of Artificial intelligence technologies has introduced radical shifts in the Accounting field, several promising avenues of research have been identified in this study through a bibliometric analysis of 931 papers, firstly,

The application of the Internet of Things in the Accounting field appears to be a subject that can be further explored. Internet of Things (IoT) technology can improve the efficiency of financial accounting management and realize the computerization of financial management (Yao, L. 2019).

another research opportunity presented in the financial accounting cluster is related to the ***application of Blockchain and Accounting field*** appears to be an area that has gained attention in research recently, Literature (Wu et al. 2019; Dai & Vasarhelyi, 2017; Yermack, D. 2017) indicates how BC may influence accounting practices and the way financial statement audits are performed and delivered Rozario & Vasarhelyi, (2018). In addition, Wu et al. 2019 identify that Blockchain technology improves significantly the relevance, faithful representation, timeliness, comparability, and other aspects of accounting information quality. More research is needed on how blockchain technology changes specific accounting subfields such as analytical accounting.

Big data and the accounting field is a subject detected in the Financial Accounting, Management Accounting, Tax Accounting, and auditing clusters, Data is the core of

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accounting, big data can assist accountants in providing more value to businesses by improving business decisions (Herath & Woods, 2021) such those related to customers, suppliers, employees, strategy and risk. For Warren et al, (2015) Big data will improve the quality and relevance of accounting information, thereby enhancing transparency and stakeholder decision-making. further, there is a great need in other accounting areas such as Tax accounting and government Accounting that need to be explored

Accounting cybersecurity in the artificial intelligence area is a subject in which few studies have been conducted. The company keeps all financial vouchers in electronic form in a database, and once the database is hacked, it can lead to all the information being stolen and damaged Liu, M. (2021).

XBRL, artificial intelligence in Accounting more research is needed on how XBRL and artificial intelligence works together for financial reporting. Mosteanu & Faccia, (2020) highlight through their research the impacts of digital solutions: eXtensible Business Reporting Language (XBRL), and Blockchain on the reduction of human errors in accounting and audit effectiveness.

6. Conclusion

Accounting is regarded as the language of a business, its primary goal is to produce information that is useful for stakeholders in the process of making business decisions, multiple sources of Accounting information depending on which subfields of accounting it comes from, the main source of accounting information is Financial Accounting, Management Accounting, and Tax Accounting. On the other hand, in the last decade, Artificial Intelligence is making a significant impact in the accounting field.

Through a bibliometric analysis study, this paper identifies and analyzes the research trends and most prominent topics and themes addressed in the literature regarding the application of artificial intelligence technologies in five accounting subfields namely Financial Accounting, Management Accounting, Tax Accounting, Auditing, and Governmental Accounting, and to define potential future research avenues for further investigation.

Using co-word analysis derived from "author keywords" of 931 papers, several conclusions can be concluded from this study. First, as shown in Figure (1-3-4) Data mining and Machine learning are the most used artificial intelligence technologies in the Accounting field. Second, as indicated in Table 1 Financial accounting is an area in which there has been a large amount of literature published, many of them addressed the issue regarding the application of artificial intelligence technologies such as machine learning and data mining in the detection of fraud in financial statements published by companies and for the prediction of corporate bankruptcy.

Third, the study reveals that "data mining"," expert system", "machine learning"," audit quality" and "financial audit" are the most popular topics regarding the application of Artificial intelligence technology in Auditing. Fourth, few literature data relating to tax Accounting and Government Accounting have been published, however, Tax evasion and under-reporting declarations are recurring topics in the implication of artificial intelligence in the tax accounting area. together with this concept

Fifth and finally, the study unpacks four major research directions for researchers planning to explore these topics: (1) the application of the Internet of Things; (2) Blockchain and Big data and the accounting field, (3) Accounting cybersecurity in the artificial intelligence era, (4) XBRL, and artificial intelligence in the Accounting field.

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