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Artificial intelligence models in corporate financial and accounting processes: systematic literature review

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Abstract

The study aims to introduce artificial intelligence models applied in the financial and accounting fields and to describe the commonly used areas, models, and algorithms that have achieved the highest level of accuracy. The methodology focuses on a systematic literature review, utilizing the Scopus Elsevier database. All studies and models are examined by application area. The results suggest that supervised models are the most applied in the accounting and financial field, while the algorithms that have been most used are decision trees, support vector machines, random forests, neural networks, and logistic regressions, employed in specific areas of financial fraud, stock market predictions, and cash flow. Although unsupervised models were not reported to be used, they represent an important scenario for future studies, focused on the classification of tax fraud.

Keywords: Artificial intelligence; accounting; finance; supervised; unsupervised models.

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Modelos de inteligencia artificial en los procesos financieros y contables de las empresas: revisión sistemática de literatura

Resumen

El estudio tiene como objetivos introducir los modelos de inteligencia artificial aplicados en el campo financiero y contable y describir las áreas, modelos y algoritmos comunmente utilizados que han logrado mayor nivel de precisión. La metodología se enfoca en una revisión sistemática de literatura, haciendo uso de la base de datos Scopus Elsevier. Se examinan todos los estudios y modelos por áreas de aplicación. Los resultados permiten asumir que los modelos supervisados son los más aplicados en el campo contable y financiero mientras que, los algoritmos que han tenido mayor utilización son los árboles de decisión, máquina de vectores, bosques aleatorios, redes neuronales y regresiones logísticas empleadas en áreas específicas de fraudes financieros, predicciones de bolsa y flujo de efectivo. A pesar de que los modelos no supervisados no reportaron ser usados, éstos representan un escenario importante para futuros estudios, enfocados en la clasificación de fraudes fiscales o tributarios.

Palabras clave: Inteligencia artificial; contabilidad; finanzas; modelos supervisados; modelos no supervisados.

1. Introduction

The business sector is experiencing a revolution in the use of Artificial Intelligence (hereinafter AI) that has changed the way of thinking and functioning of many organizations and professionals (Rawashdeh et al., 2023). Machines can now replace tasks performed by people with greater efficiency and accuracy and with proper programming of parameters or instructions (Muller et al., 2023; Zhang & Lei, 2022). Undoubtedly, this AI scenario overcomes all the barriers that have currently been created in professional fields, especially in accounting and financial issues, where systems programmed by AI are capable of analyzing large volumes of financial

data and making predictions and audits in less time (Fedyk et al., 2022; Kavitha & Singh, 2019).

This revolution has generated interest among professionals and researchers in knowing the impact of AI in the accounting field and its potential for practical implementation. Recent studies have shown that AI can improve operations and performance in inventory management, creating a mechanism for predicting the purchase, sale, and promotion of products (Fallahi et al., 2022). The application of AI in auditing processes for the analysis of large volumes of data and cross-checking of information can prevent and detect tax and accounting fraud in companies (Zemánková, 2019). Furthermore, AI has shown great application in financial

analysis and preparation of indicator reports, as well as the review of reports and audit process errors (Noordin & Hussainey, 2022; Chen et al., 2022).

However, some difficulties have been evidenced in using AI in accounting and financial processes, associated with the training of accounting professionals in using models, tools, and algorithms driven by artificial intelligence (Zhang et al., 2020; Behera et al., 2020). Besides, the accounting and administrative professional profile lacks understanding and competence in using data languages and capabilities to analyze large volumes of data through AI-driven models. Also, it has been detected that professionals are afraid of using AI models to analyze financial statements or financial situations (Weber, 2023; Roy et al., 2020).

The facts mentioned above have led to understanding the importance of using AI models and tools in the accounting and financial fields to improve business practices and enhance financial information analysis processes through intelligent models that optimize time, improve errors, and generate more accurate reports with predictive indicators or classification. Hence, the objective of this study is to identify the artificial intelligence models applied in the financial and accounting fields and to describe them. It implies to detail the algorithms used according to the accounting and financial area in the business field (Yousaf et al., 2022).

2. Literature review on artificial intelligence

AI refers to technological tools, including computer systems and machines, that emulate human cognitive functions through automated learning,

enabling language processing, need comprehension, and the delivery of rapid, accurate solutions to analyzed problems (Vu et al., 2022). AI is a complex set of tools that allow for analyzing large volumes of data and predicting behavior, in a given scenario or simulation, of a production process with various analysis variables (Ubina & Cheng, 2022). Some authors have described AI as a computational emulation of human thought that simulates information decisions through learning and configuration, allowing for objective analysis of uncertain scenarios (Atia et al., 2011). These AI systems are equipped with adaptive and continuous learning features, enabling them to recognize parameters and simulate various scenarios based on analyzed information (Khaoula et al., 2021).

From a broader perspective, algorithmic decisions that deeply impact daily decisions are known as AI. These data systems allow for analyzing risks, variables, styles, and behaviors in various scenarios, such as business, government, education, or justice, providing an objective and precise prediction scenario (Thiebes et al., 2021). The truth of all these definitions of AI is that technological advances have permitted machines and computer systems to analyze large volumes of data, which would be impossible for humans to perform in minimum time and with greater efficiency. Therefore, AI is considered a technological mechanism created by humans to analyze large volumes of data and enable prediction, analysis, and interpretation of information for decision-making in projected scenarios.

3. Methodological perspective of the study

The steps used by the authors

during the literature review process are described in this section. The research topics, search tactics, and methodology are all laid forth. Additionally, a thorough explanation of the criteria for source selection and document exclusion is provided. This study employs a bibliometric literature review, structured around three distinct phases: (i) planning, involving the identification of the review's purpose and the establishment of its methodology; (ii) execution, dedicated to conducting the review; and (iii) reporting, focused on the evaluation and presentation of findings. Furthermore, the methodology integrates a three-stage information analysis process, consisting of monitoring, system analysis, and decision-making (Aguilar et al., 2021).

3.1 Review Planning

This first phase involved the search methodology that was formulated to retrieve scholarly relevant articles to the study's research questions. These questions, which define the scope and objectives of the review, are:

- Q1: What artificial intelligence models have been developed to support monitoring, analysis, and decision-making processes in accounting and financial management?
- Q2: What are the key application domains of artificial intelligence within the context of corporate accounting and financial management?

3.2 Review Execution

As it was mentioned before, to conduct the document exploration and execution, we used the SCOPUS Elsevier database.

The inclusion and selection criteria were as follows: "artificial intelligence models" OR "machine learning models" AND accounting OR finance OR financial AND firm OR business OR company. Also, articles in English related to the research questions and research articles available in digital paper format. The exclusion criteria involved: Articles with personal opinions, conference posters, or abstracts from articles.

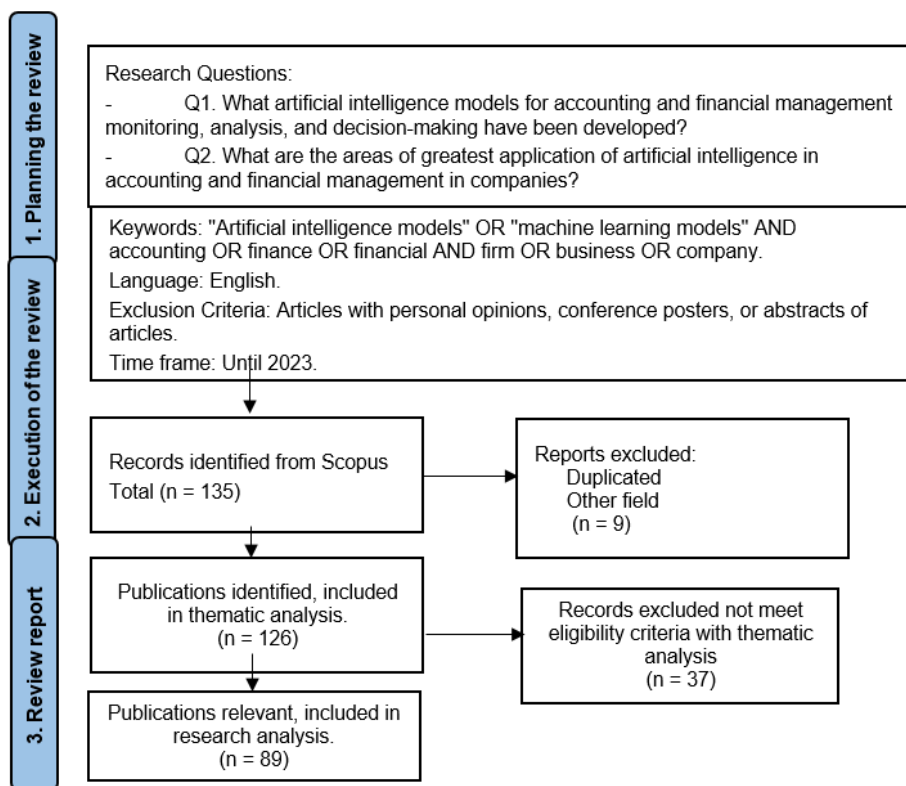
This execution research process was conducted through several steps. First, articles were identified by title and keywords using specific search queries. This was followed by applying the snowballing method, which entails finding additional pertinent documents by reviewing references from the articles initially chosen. While this step could be iterated multiple times, for this study it was performed only once. Abstracts from potential articles, identified in earlier phases, were evaluated applying the inclusion and exclusion criteria to assess their relevance for further analysis. Finally, the full texts of articles selected in the preceding step were thoroughly reviewed against the same criteria to determine their suitability and inclusion in the study.

3.3 Review Report

The initial search, applying inclusion and selection criteria with author-specified keywords, yielded 135 English-language articles. After eliminating duplicates and refining the results through keyword filtering, 126 documents were retained. A final review against the inclusion criteria narrowed the selection to 89 texts. Diagram 1 illustrates the comprehensive systematic review process.

Diagram 1

Process Diagram of the Systematic Review: Artificial Intelligence Models in Financial and Accounting Processes



4. Results of Applying Supervised, Unsupervised, and Reinforcement AI Models

Artificial intelligence (AI) models are becoming indispensable for assessing the financial health of individuals and businesses. Abdullah (2021) asserts that regulated models, particularly in the accounting and finance domains, are crucial for estimating future revenues and losses within a specific timeframe. According to

Fontalvo-Herrera et al. (2021), these models enable the prediction of future occurrences on datasets through linear regression analysis. Finding patterns in accounting and financial records is also essential for spotting inconsistencies and data exploitation. Also, unstructured aspects like correlations must be taken into consideration.

To ensure adequate training and achieve desired performance levels, reinforcement AI models require access to significant data resources. These

models are frequently used in the financial sector for fraud detection or projections of stock market predictions. According to Berloco et al. (2021), studies utilizing reinforcement models for financial investment show increased profitability and predictive accuracy, with notable benefits observed when substantial historical data is available. In these analyses, AI can improve the financial health of companies by generating data patterns.

On the other hand, AI is also used in repetitive financial automation processes, which increases the accuracy and efficiency of processing large volumes of data from accounting and financial records. These intelligent systems are of great help in financial transaction review processes because AI performs tasks without the need for supervision with prior training. Accounting transaction recording, voucher review, and financial analysis can be streamlined and enhanced for accuracy through the implementation of AI. The ability of AI to detect anomalies and suspicious operations in companies is further amplified by its real-time error correction capabilities. Classification models enable the immediate identification and rectification of errors, groupings, and accounting adjustments. Consequently, AI model integration substantially benefits corporate decision-making in accounting and financial domains.

4.1 Application of AI reinforcement models in accounting and financial processes

From the perspective of Agarwal & Muppalaneni (2022), AI models in the accounting and financial field have

become relevant in specific areas of stock prediction in the stock market. These models allow for the prediction of the behavior of listed stocks to make financial leverage decisions. In addition, these intelligent models are also used to reduce the company's portfolio accounts, making risk predictions when granting credits. All these models are created from machine learning with linear function programming or regressions.

The study developed by Alam et al. (2021) generates a forecasting system for short-term stocks listed online. It also employs sentiment analysis of historical data with an AI platform. Through this, the system's effectiveness is demonstrated with high accuracy, outperforming other models in the prediction areas. Likewise, Zhao et al. (2023) created the TSRM model to improve stock price forecasts using transactional data. This model evaluates temporal data and stock market linkages using LSTM and GCN networks.

4.2 Application of Supervised Artificial Intelligence Methods with neural net-works in Accounting and Finance

An interesting study in supervised AI models is the research conducted by Ahelegbey et al. (2023) that evaluates a machine learning model in a Fintech platform from a sustainable finance perspective. The author links macroeconomic trends, such as microeconomic data from corporate credit allocations and risk categories, for the study. The model uses machine learning techniques to evaluate 100,000 companies and predict credit approval. These results determine that the AI model developed in the Fintech platform can

generate an assessment for companies with a high probability of predicting credit ratings.

4.3 Application of supervised regression models in accounting and financial processes

Some researches support the application of these models. First, it is found the study developed by Abdullah (2021), who demonstrated the possibility to evaluate the financial solvency using a sample of 244 companies, listed on the stock exchange from 2015-2019. The sample was classified into safe, healthy, and insolvent groups using Altman's Z-score by applying five different classifiers.

The performance of these classifiers was assessed with a range of metrics. Notably, the artificial neural network classifier recorded an accuracy and sensitivity rate of 88% and an AUC of 96%, while the ensemble classifier surpassed all others in log loss and several other metrics. The outcomes of this study are valuable for credit scoring, credit ratings, and loan rankings at financial institutions. Additionally, companies can employ machine learning models to evaluate their financial health. A key contribution of this research is addressing a gap in the literature by applying these models to a similar dataset within the Bangladeshi context, a methodology not previously explored.

As a second investigation, it is important to mention the research conducted by Barboza *et al.*, (2021) who compares traditional statistical approaches, such as discriminant analysis and regression, against the efficacy of alternative models in

forecasting bankruptcy events one year in advance. They employ logistics and the first generation of artificial intelligence models, including artificial neural networks. The study forecasts bankruptcy occurrences using machine learning models such as support vector machines, bagging, momentum, and random forests and compares their performance with classical approaches. The findings reveal that machine learning models surpass traditional models by approximately 10%. Specifically, random forest models demonstrate the highest accuracy rate of 87%, while logistic regression and linear discriminant analysis exhibit lower accuracy rates of 69% and 50%, respectively. Additionally, the study identifies that forecast accuracy is enhanced when extra financial indicators are incorporated as predictor variables. This supports the applicability of expert systems for professionals.

In this sense, Aldhyani & Alzahrani (2022) set out to develop an intelligent framework capable of predicting the direction of stock market prices using financial time series data as input. Among cutting-edge technologies, artificial intelligence forms the foundation of numerous models forecasting market direction. Specifically, deep learning algorithms have shown efficacy in predicting market behavior.

A fourth research, is represented by the study of Barboza *et al.* (2017). Their purpose was to develop bankruptcy forecasting models for US non-financial firms by evaluating various statistical and machine learning techniques, including discriminant analysis, logistic regression, neural networks, support vector machines, AdaBoost, bagging, and random forest. The research utilized a dataset from 1980 to 2014, examining inputs such as static, growth, and

variation in growth. The results indicate that traditional techniques, when applied with suitable variables, achieve superior performance compared to machine learning models, contrary to current literature. Unlike existing research, the findings suggest that traditional techniques with appropriate variables are more effective than machine learning models in producing higher performance. However, the study contributes to the literature by offering a comprehensive sample and performance comparison that practitioners and scholars may utilize.

Finally, Alotzman et al. (2022), utilized gradient boosting techniques to address the issue of imbalanced credit fraud data in their study. The research applied logistic regression, decision trees, and advanced gradient boosting models, including XGboost and CatBoost, for predictions, following the data segmentation into training and testing sets. An oversampling approach was employed to address the imbalance in data distribution.

The effectiveness of these algorithms was evaluated using metrics like accuracy, precision, recall, and the F1 score. The findings indicated a significant enhancement in the accuracy of the CatBoost model through Bayesian optimization. Notably, the XGboost model demonstrated superior performance over others when the Oversample technique was implemented on the unbalanced data set. This comprehensive analysis provided a detailed comparison of the algorithms, outlining their advantages and disadvantages, which is invaluable for advancing credit fraud detection research, employing machine learning techniques.

Nonetheless, the study's scope was limited to a particular dataset; hence,

its findings might not be universally extended across different datasets. The research predominantly focused on two gradient boosting algorithms, XGboost and CatBoost, leaving room for potentially better-performing algorithms on varied datasets. The Oversample method's efficacy in data balancing could vary, and based on selected metrics, the performance evaluation might not fully represent the models' efficiency. Conclusively, the study posits that machine learning techniques offer advancements in detecting credit fraud over conventional methods, suggesting that future inquiries could investigate alternative algorithms and strategies to enhance model performance in credit fraud detection scenarios.

4.4 Results of applying artificial intelligence in the accounting and financial sub-areas

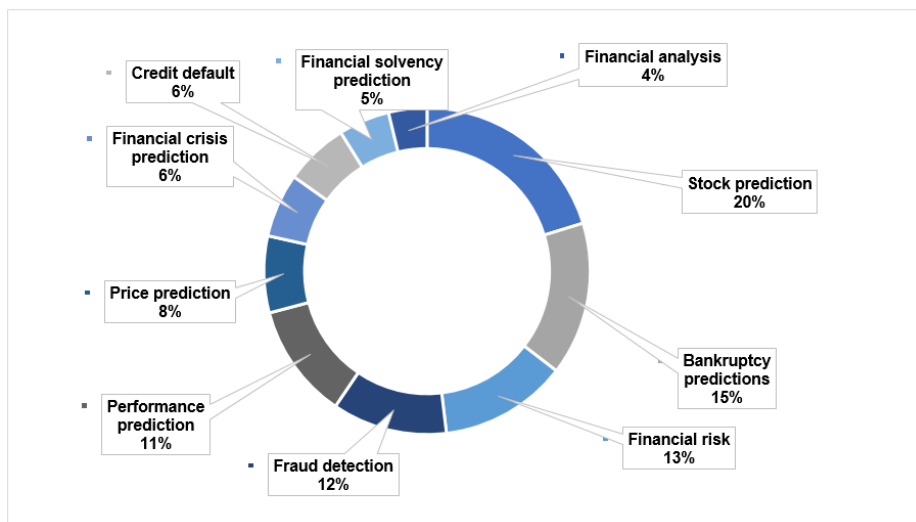
Artificial intelligence (AI) has undoubtedly been one of the most significant changes in recent times, transforming how companies conduct their activities, commerce operations, accounting, finance, stock market, investments, and employee turnover. All these indicators can be evaluated to improve performance and reduce production and operating costs. Machines can now perform previously repetitive and time-consuming tasks in less time and with greater precision.

In this section, we describe some areas of AI application in the financial and accounting fields of the company, such as stock prediction, bankruptcy prediction, credit prediction, financing, solvency, and fraud detection, all of which are essential when making decisions. In

each of these areas, shown in Graphic 1, we explain why AI is an essential tool

for improving business accounting and finance.

Graphic 1
Areas covered by articles presenting reviews on accounting and finance



The results of the bibliometric analysis, shown in Figure 2, allow confirming what Fallahi et al. (2022) pointed out in the literature review, regarding the positive impact of artificial intelligence in improving operations and strategies in companies. In this sense, the bibliometric results demonstrate an increase in publications related to artificial intelligence in accounting and finance that constitute the accounting transformation in the digital era. However, the results contradict to what Weber (2023) raised about the lack of academic training in data science for financial professionals as a challenge for the efficient implementation of intelligent models. Though, the bib-biometric results

show that countries such as Brazil, Japan, Pakistan, and Poland, despite having a more modest scientific output, enjoy greater visibility, suggesting that accounting and financial professionals can overcome these training barriers through quality research.

Likewise, the bibliometric results reveal a trend towards the publication of high-quality research in prestigious journals, as evidenced in the countries mentioned with lower scientific production but higher visibility, suggesting a tendency towards valuing quality over quantity in accounting and finance research.

In relation to the application of supervised, unsupervised and

reinforcement models, the results confirm the position of Abdullah (2021) on the importance of controllable and reinforcing models for forecasting future profits and losses at a predetermined time. This is in line with the presented review, which shows how supervised, unsupervised, and reinforcing models are fundamental in predicting the financial health of both organizations and individuals. Nevertheless, these results reject Weber's (2023) findings regarding the difficulty associated with implementing intelligent models in accounting and finance due to the lack of academic training in data science for financial professionals.

The results demonstrate the efficiency of the models in the financial field and their use in the process of reviewing accounting and financial irregularities and errors in fraud-related issues. As well as the application to make predictions in the stock, bond and futures markets. Undoubtedly, the use of AI models has increased efficiency in the operation of companies and has increased efficiency in various repetitive tasks in organizations, managing to automate jobs.

With respect to the application of artificial intelligence in the accounting and financial sub-areas, AI models in the field of bankruptcy prediction have helped multiple companies and economic sectors to prevent economic and non-payment problems. The special use of neural networks has helped to improve the prediction of stock prices using automatic time series method (Zhang & Lei, 2022; Aldhyani & Al-Zahrani, 2022), in addition to this, random forest models have demonstrated a greater ability than other models to make predictions of financial distress (Yousaf et al., 2022; Barboza et al., 2017; Roy et al., 2020;

Kavitha & Singh, 2019). The integration of external real-time news, in addition to historical and market behavior data, is essential for achieving enhanced performance and accuracy in these models (Behera et al., 2020). Besides, there are machine learning algorithms that reinforce the evaluation processes, such as BSM-SAES, which helps in bankruptcy prediction, especially in the prediction of intangible assets (Fontalvo-Herrera et al., 2021).

5. Conclusions

The application of AI in financial and accounting processes has significantly enhanced financial analysis and forecasting. Regression models, neural networks, random forests, and support vector machines have proven highly effective in improving corporate economic conditions. These AI models enable organizations and external stakeholders to predict economic behavior, facilitating informed financing, investment, and funding decisions. Furthermore, they excel at credit risk assessment and fraud detection. Data utilization has become crucial for financial sector companies, enabling them to mitigate fraud and defaults through these models.

Current research predominantly focuses on predicting stock market behavior, economic insolvency, and bankruptcy. While these areas are well-explored, there is a relative scarcity of studies analyzing accounting and tax errors in financial statements. Nonetheless, research demonstrates the potential of algorithms to enhance the accuracy of financial audits

Regarding the models and algorithms used, this research has highlighted that most studies have focused on supervised models where

decision trees, random trees, vector supports, logistic regression, linear regression, and neural network models prevail. These models have demonstrated high accuracy in prediction and classification processes, stressing models such as XGBoost, LightGBM, deep learning, and neural networks used in the financial prediction of companies' solvency. As a highpoint in financial risk management, especially default risk, ANN neural network models have achieved good results in the rating process.

Specifically, AI models applied in the financial risk field have significantly advanced their algorithms, where advanced algorithms such as Gradient Boosting, Extreme Gradient Boosting (XGBoost), and CatBoost have stood out.) These models improve accuracy in identifying fraudulent activities and addressing the challenge of unbalanced classes in the data. In the same field, techniques such as the Least Absolute Shrinkage Selection Operator (LASSO) and Bayesian networks (LASSO-BN) have been incorporated, showing how integrating statistical and machine learning methods offers novel insights into insolvency prediction.

Similarly, the diversity of models and techniques, from logistic regression to support vector machines (SVMs) and multiclass classification, reflect the adaptability and strength of machine learning in financial analysis. This range of tools facilitates credit risk assessment and management and opens new avenues to improve investment and financing decisions.

In any case, these results highlight certain limitations and future challenges, including possible biases in AI models and potential ethical risks in automated decision-making processes in business.

This issue requires balanced reflection in future research to help dimension the added value of AI in financial and accounting management.

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