2025 IEEE 6th International Seminar on Artificial Intelligence, Networking and Information Technology (AINIT) | 979-8-3315-2228-5/25/$31.00 ©2025 IEEE | DOI: 10.1109/AINIT65432.2025.11035079

Research on optimizing financial audit process using AI

Xiaqiu Long*
Sichuan University Jinjiang College, Meishan, 620860, China
goldenleaf777@163.com

***Abstract*—This paper aims to study how to use artificial intelligence technology to intelligently upgrade the financial audit process and enhance the efficiency and accuracy of audit operations. This study uses a case analysis method to conduct a detailed investigation of the operating model of a multinational company. It integrates innovative applications of artificial intelligence technologies such as machine learning, deep learning, and natural language processing, expands the boundaries of intelligence, and automates audit stages such as automatic data collection, preprocessing, anomaly detection, and report preparation. Compared with traditional audit methods, the results show that the application of artificial intelligence has significantly improved the efficiency of audit work, greatly shortened the audit cycle, optimized the accuracy level of error identification, and significantly improved the accuracy level of risk prediction. The application of artificial intelligence technology has promoted the comprehensive upgrade of the financial audit process and significantly improved the efficiency and accuracy of audit activities. The system has shown obvious performance advantages in risk identification and report preparation.**

Keywords- artificial intelligence, financial auditing, machine learning, automation

I. INTRODUCTION

The traditional financial audit mode, which relies heavily on manual process, is inefficient and error-prone in most cases, which makes the audit cost increase and accuracy decrease. Due to the rapid increase of data and the progress of technology, it is very important to integrate artificial intelligence (AI) into the audit process to improve efficiency and quality[1]. Artificial intelligence tools can automatically complete data collection, purification and in-depth analysis, and then quickly identify potential risks and anomalies. This is not only helpful for auditors to find out the problems effectively, but also can improve the comprehensive coverage of the audit. Even though artificial intelligence shows good potential in the field of financial audit, challenges still exist in data quality, technical implementation and compliance. This study focuses on exploring how to effectively use artificial intelligence in optimizing the audit process, judging its impact, and providing a theoretical and practical framework for the future role of artificial intelligence in financial audit..

II. AI TECHNOLOGY OVERVIEW

A. Principles of AI Technology

Figure 1 shows the interdependence between artificial intelligence, machine learning, deep learning and natural language processing. Artificial intelligence research involves many cross-disciplinary fields, forming a huge knowledge network that comprehensively covers all technical categories aimed at imitating or simulating human intelligence. As the key to the development of artificial intelligence technology, machine learning plays a core role, emphasizing the use of algorithmic technology to achieve self-learning and optimization and upgrading of the system, without using explicit programming methods [2] . Deep learning is a branch of machine learning with a higher technical level. It uses multi-layer neural network technology to conduct deep learning and intelligent analysis of complex data patterns, which is particularly suitable for the processing requirements of big data and unstructured data. The research scope of natural language processing draws on the research scope of artificial intelligence and machine learning[3].

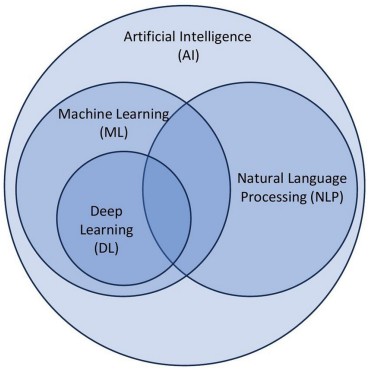

Figure 1. Principles of AI technology

B. Main Algorithms of AI Technology

In the field of artificial intelligence technology, algorithms such as machine learning, deep learning, and natural language processing have become key technical supports. Each system is built using its own unique mathematical principles and models. Financial auditing technology has successfully realized an automated platform for automatic data analysis, risk assessment, and report preparation [4] .The linear regression model uses the least squares method to fit the data curve and accurately grasp the predictive ability of the relationship between the target variable and the input features. The formula is expressed as:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_n x_n + \epsilon \qquad (1)$$

Among them, y as the dependent variable, in regression analysis, β the coefficient reflects the linear relationship between variables, x and as a set of characteristic indicators at the input level, the error variable ϵ is introduced. In the

processing of classification problems, the logistic regression model is an indispensable algorithm. The mathematical formula definition mode of this mathematical formula is:

$$P(y=1|\ X)=\frac{1}{1+e^{-(\beta_0+\beta_1 x_1+\cdots+\beta_n x_n)}} \tag{2}$$

In the implementation stage of financial audit, in the classification task, the logistic regression model has significant application potential and can make a detailed definition of standard transactions and abnormal transactions [5] .The mean square error (MSE) is a typical loss function in the field of machine learning:

$$L=\frac{1}{N}\sum_{i=1}^{N}\left(y_i-\hat{y}_i\right)^2 \tag{3}$$

Among them, y_i as a symbolic definition of the actual numerical value, the predicted result is recorded as y_i, N as an identifier of the sample number, in the field of financial data feature extraction, deep learning technology shows significant advantages in automation, explores the potential regular connections in complex data, and significantly improves the efficiency and accuracy of audit procedures [6] .

The improvement of text content classification model is discussed. The mathematical expression of this mathematical problem can be written as:

$$P(C|\ X)=\frac{P(X|\ C)P(C)}{P(X)} \tag{4}$$

Among them, within the framework of established features X , the probability $P(C)$ can be calculated, and C the mathematical description of the probability of occurrence of category events. In C the constraint environment of the category, X the probability value of the feature can be defined as $P(X|\ C)$, in terms of the C category, its $P(C)$ prior probability measure , and the marginal probability of $P(X)$ the feature X . It is one of the basic concepts in probability theory.

III. Use AI to Optimize Financial Audit Processes

In the early stage of financial audit, artificial intelligence technologies such as machine learning (ML) and deep learning (DL) simplified the process of collecting, arranging and preprocessing the company's financial data. ML algorithm can detect anomalies and errors, automatically clean up data by deleting duplicate data and filling in missing values, and reduce the work for manual audit. Deep learning can deal with complex data, identify complex financial risks and abnormal trading phenomena, give analysis of potential problems, and then realize proactive risk prediction. NLP can transform these analyses into standardized and unified audit reports, automatically generate texts, and improve the accuracy and preparation efficiency of reports, which is very important. With these enhanced functions driven by artificial intelligence, auditors can make wise decisions, optimize all stages of audit, and then greatly. Figure 2 reveals the specific application details of AI technology in the entire financial audit process. Each audit link is optimized using AI technology, and data processing efficiency has been significantly improved, greatly improving the accuracy of risk prediction and the efficiency of report preparation.

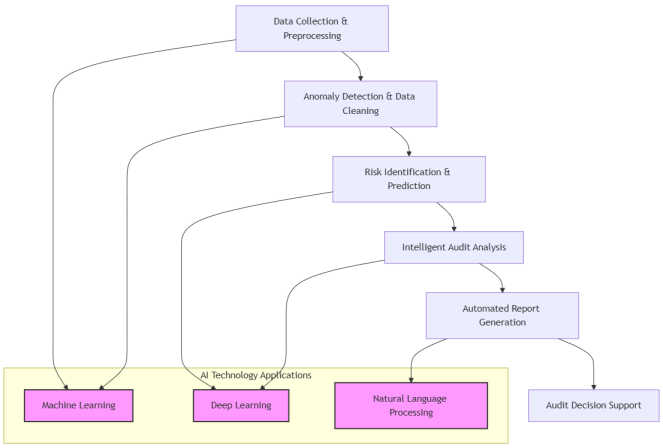

Figure 2. The application process of AI technology in the entire financial audit process

A. Automated data collection and preprocessing

The initial stage of financial auditing involves the collection and preliminary processing of data, which is critical to the maintenance of the accuracy of subsequent analysis. Audit executors must personally collect and organize various financial data. This operation is time-consuming and labor-intensive, and errors are more common. The use of artificial intelligence technology to automate the data collection and preprocessing process has significantly improved work efficiency. Relying on machine learning and data mining technology, based on advanced information processing technology, relevant data in the enterprise financial management system can be automatically captured, and data cleaning, standardization, deduplication and other pre-processing processes can be implemented simultaneously. In the data preprocessing stage, a commonly used strategy is to fill in missing data. Taking arithmetic mean filling as an example, in the data cleaning stage, for the missing values of this feature, the mean filling method is generally used to recover data. The calculation process can be achieved with the help of this formula:

$$x_{\text{fill}}=\frac{1}{n}\sum_{i=1}^{n}x_i \tag{5}$$

Among them, x_{fill} is the filled data, x_i is the original data, and n is the number of samples.

B. Risk Identification and Anomaly Detection

In the implementation stage of financial audit, risk identification and abnormal situation monitoring are extremely critical. This system helps audit experts to efficiently identify potential financial risks and violations. Relying on the training of machine learning models, artificial intelligence technology has entered a new stage of intelligence, and can reveal potential

abnormal financial patterns with historical financial data. For the problem of anomaly detection, the K-means clustering algorithm has become the preferred method in clustering analysis technology. It implements segmentation operations on data sets, systematically classifies similar behavioral attributes in financial operations, and then identifies abnormal transaction behaviors and their patterns. The basic step of the K -means clustering algorithm is to implement k-cluster segmentation of the data set to maximize the similarity between data points in the cluster. The data points in different clusters are quite different, showing obvious numerical differences. The core goal of this objective function is to minimize the sum of the squares of the distances between each data point in the cluster and the cluster center:

$$J = \sum_{i=1}^{k} \sum_{x_j \in C_i} \| x_j - \mu_i \|^2 \quad (6)$$

Among them, C_i the symbol corresponds to the i - th cluster, x_j is the professional term definition of the data point in the cluster, μ_i defines the coordinates of the center point of the i- th cluster, and the Euclidean distance between the data point and the cluster center can be expressed as $\| x_j - \mu_i \|$.

C. Intelligent audit analysis and report generation

At the report generation stage, AI initially conducted in-depth mining of financial data, using the ARIMA model to perform trend forecasting and in-depth analysis of financial conditions. The ARIMA model, or autoregressive integrated moving average model, is a classic model in the field of time series analysis. It accurately predicts the trend in financial data, especially when dealing with financial forecasts. This advantage is particularly noteworthy. For example, the following is the mathematical formula of the ARIMA model:

$$Y_t = \mu + \phi_1 Y_{t-1} + \phi_2 Y_{t-2} + \ldots + \phi_p Y_{t-p} + \theta_1 \epsilon_{t-1} + \theta_2 \epsilon_{t-2} + \ldots + \theta_q \epsilon_{t-q} + \epsilon_t$$

Among them, the prediction result at time t is represented by Y_t, μ is the constant term ϕ and θ, which are the key parameters of the autoregressive and sliding average models. In the mathematical model, the error term is represented by ϵ_t. Relying on this mathematical model, AI technology accurately predicts the future financial trend, provides support for audit decisions, and reveals potential risk points.

IV. Application effect evaluation

A. Application Cases

AI technology plays a key role in data management, anomaly identification and risk prediction. As shown in Table 1.Siemens AI realizes automated processing in data cleaning and risk identification, especially when processing large-scale cross-border financial data. Deep learning and machine learning technologies have greatly improved the accuracy of anomaly detection and data precision.

TABLE 1. SIEMENS AG'S FINANCIAL DATA

Financial Year	Revenue (billions of euros)	Net profit (billions of euros)	Total assets (billion euros)	Number of Employees
2023	77.69	7.97	1450.67	320,000
2024	75.93	9.00	1478.12	327,000

As a world-renowned technology group, Apple is well-deserved. It provides innovative electronic products and services, a huge financial data group, and a complex structure across multiple business segments and different regions. Apple's financial audit includes multiple stages, and the core issues are revenue recognition, cost control and profit optimization. As shown in Table 2:

TABLE 2. FINANCIAL DATA OF APPLE IN.

Financial Year	Revenue (billions of US dollars)	Net profit (billion US dollars)	Total assets (billion USD)	Number of Employees
2023	394.33	99.80	384.60	164,000
2024	387.53	96.70	379.80	168,000

During the audit phase of Apple, AI technology has been widely used in the fields of real-time data processing, risk prediction and automatic report generation. With the support of natural language processing technology, auditors can quickly extract key information from financial statements, improving the efficiency of report generation.The performance is strong and cannot be ignored. As shown in Table 3:

Table 3. MICROSOFT CO.'S FINANCIAL DATA

Financial Year	Revenue (billions of US dollars)	Net profit (billion US dollars)	Total assets (billion USD)	Number of employees
2023	211.91	72.75	384.63	Number of employees
2024	222.07	77.99	396.50	Number of employees

TABLE 4. KEY PERFORMANCE INDICATOR COMPARISON BEFORE AND AFTER AI APPLICATION

Indicator	Before AI Application (Manual Audit)	After AI Application (AI Audit)
Audit Coverage Rate	85%	98%
False Positive Rate	10%	5%
False Negative Rate	15%	3%
Processing Delay (hours)	24 hours	4 hours
Risk Prediction Accuracy	N/A	95%
Audit Report Generation Time (hours)	12 hours	2 hours

Microsoft AI helps data analysis achieve a double leap in automation and accuracy, especially in real-time monitoring of financial data and risk identification. With advanced machine learning algorithms, Microsoft is highly efficient in identifying

potential financial risks and abnormal trading behaviors.The AI audit system is used to carry out pre-processing activities such as data cleaning, supplementing missing values, and screening outliers, and then the above key performance indicators are calculated. By comparing and analyzing the changes in various indicators after the start and end of the audit, the improvement performance of the AI system efficiency and accuracy is fully evaluated, as shown in Table 4.

B. Application effect evaluation

The application of artificial intelligence technology in financial auditing has effectively improved the level of various audit indicators, and the intelligent and automated effects have been significantly enhanced. This table comprehensively shows the comparison of key audit indicators before and after the application of artificial intelligence. Artificial intelligence has greatly improved audit efficiency, accuracy and speed. Data comparison before and after the application of artificial intelligence technology

TABLE 5. THE DISCUSSION ON THE APPLICATION OF ARTIFICIAL

Index	Before AI Application	After AI Application
Total Transactions Reviewed	100,000	100,000
Average Processing Time (hours)	1,800	400
Number of False Recognitions	5	25
Risk Prediction Accuracy	N/A	95%
Audit Report Generation Time (hours)	720	120
Total Audit Time (hours)	2,520	640
Error Detection Efficiency (%)	85%	98%
Fraud Detection Rate	60%	90%
Risk Assessment Time (hours)	500	100

The data in Table 5 show that the financial audit process has achieved comprehensive progress due to the intervention of AI technology, and the processing time has been significantly shortened.

C. Comparative analysis with other AI audit systems

In order to analyze the advantages and innovative highlights of this system, this study conducted a comparative analysis of the other two mainstream AI audit systems (ACL and IDEA), and made a detailed comparison in terms of function, performance and cost. The processing speed and accuracy of this system are superior to ACL and IDEA, especially in risk prediction and anomaly detection. The cost of using this system is lower than that of ACL and IDEA, making it more competitive in the market, further highlighting the application potential of this system in the audit field, as shown in Table 6:

TABLE 6. COMPARISON OF AI AUDIT SYSTEMS' FUNCTIONALITY, PERFORMANCE, AND COST

Comparison Dimension	Proposed System	ACL	IDEA
Core Functionality	Data cleaning, risk identification, anomaly detection, automatic report generation	Data analysis, anomaly detection, compliance check	Data analysis, trend forecasting, report generation
Processing Speed	Fast (Average Processing Time: 4 hours)	Moderate (Average Processing Time: 8 hours)	Slow (Average Processing Time: 12 hours)
Accuracy	High (Risk Prediction Accuracy: 95%)	Moderate (Risk Prediction Accuracy: 85%)	Moderate (Risk Prediction Accuracy: 80%)
Cost (per year)	Low (~$20,000)	High (~$50,000)	High (~$40,000)
Applicable Industries	Multiple industries (Manufacturing, Retail, Finance, etc.)	Finance, Accounting	Manufacturing, Finance

V. CONCLUSION

The integration of artificial intelligence (AI) in financial auditing has greatly enhanced efficiency, accuracy, and decision support. AI automates data collection and processing, reducing manual efforts and improving anomaly detection and risk assessment. However, challenges such as data quality, technical complexity, and compliance risks persist. To advance AI use in auditing, it is essential to prioritize data standardization and continuous technological improvements. The rapid evolution of AI promises more effective and accurate support for businesses and audit institutions, steering the industry towards intelligent automation.

REFERENCES

[1] Hasan A R. Artificial Intelligence (AI) in accounting & auditing: A Literature review[J]. Open Journal of Business and Management, 2021, 10(1): 440-465.

[2] Munagandla VB , Dandyala S S V, Vadde BC, et al. AI-Driven Optimization of Research Proposal Systems in Higher Education[J]. Revista de Inteligencia Artificial en Medicina , 2024, 15(1): 650-672.

[3] Ferreira FGDC, Gandomi AH, Cardoso RT N. Artificial intelligence applied to stock market trading: a review[J]. IEEE Access, 2021, 9: 30898-30917.

[4] Zhu W, Zhang T, Wu Y, et al. Research on optimization of an enterprise financial risk early warning method based on the DS-RF model[J]. International review of financial analysis, 2022, 81: 102140.

[5] Soudagar MEM, Shelare S, Marghade D, et al. Optimizing IC engine efficiency: A comprehensive review on biodiesel, nanofluid, and the role of artificial intelligence and machine learning[J]. Energy Conversion and Management, 2024, 307: 118337.

[6] Weber P, Carl KV, Hinz O. Applications of explainable artificial intelligence in finance—a systematic review of finance, information systems, and computer science literature[J]. Management Review Quarterly, 2024, 74(2): 867-907.