Research on the Application of Artificial Intelligence Technology in Audit Under the Background of Big Data

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Abstract. In the era of big data, artificial intelligence technology is gradually applied to audit, which requires auditors to have both traditional audit knowledge and modern technology. Based on this, this paper takes the application of artificial intelligence in audit from the perspective of big data as the research object. Firstly, it expounds the concept and development of big data and artificial intelligence, and then discusses the specific application of artificial intelligence in audit under the background of big data by analysing typical artificial intelligence systems. Finally, it analyses the future development and challenges of artificial intelligence to the audit profession.

Keywords: Artificial Intelligence, audit, big data.

1. Introduction
Modern technology is reshaping the whole human world. Technology plays a very important role in promoting economic development and reshaping society. In the 21st century, with the help of the Internet development wave, enterprises have realized network application, and network finance began to appear. After that, the vigorous development of Internet of things, cloud computing, big data, blockchain and artificial intelligence technology further promoted the in-depth application of enterprise informatization, realized the in-depth integration of financial business, and more and more structured and unstructured data were automatically collected and integrated into the enterprise information ecosystem. With the rapid development of artificial intelligence, it has been applied in all aspects of people's life and greatly promoted the reform of society. In modern enterprises, auxiliary tools based on information technology such as big data and artificial intelligence are gradually occupying an important position. As an important part of enterprise economic activities, the application of artificial intelligence technology can greatly improve the efficiency and quality of audit and promote the benign development of enterprises. It is one of the main trends of audit development in the future.

2. Overview of big data and artificial intelligence
Big data technology is a popular technology in recent years. Its technical feature is that it can store and calculate a large number of structured and unstructured data, make effective use of computing resources and enable people to dynamically obtain resources. In order to make better use of the advantages of big data and cloud computing, first of all, data storage and transmission technology is very important. For example, distributed file system can be used to store unstructured data, while data warehouse system can store structured data with high confidentiality requirements. Secondly, to use big data technology,
we must analyze and process data. Thirdly, the ultimate goal of using big data is to convert it into the required data, and then use data analysis to perform appropriate optimization to provide managers with the data needed for decision-making. Finally, in the context of big data, managers can use visualization, spatial information flow and other related technologies to display data, intuitively feel the audited data information and improve audit efficiency [1].

Artificial intelligence originated in the 1950s. It has encountered technical bottlenecks for many times and experienced several ups and downs. With the support of new artificial intelligence technology represented by big data, the current artificial intelligence has entered a period of rapid development. Modern society has enough massive data, powerful computing power and the continuous development of algorithms, which makes artificial intelligence technology one of the most popular technologies at present. Based on the development of information service, artificial intelligence endows mechanical equipment with certain intelligence through the use of logic chip and information service, so that it can replace people to carry out more complex work. Compared with traditional intelligent technology, artificial intelligence has stronger ability of information analysis, cooperation, learning and reasoning.

3. Application of artificial intelligence in audit under the background of big data

In the process of the rapid development of big data and artificial intelligence, researchers are constantly committed to developing advanced and efficient artificial intelligence systems to help auditors make better decisions and perform tasks more accurately and avoid auditors’ negligence. With the help of artificial intelligence technology, intelligent audit can not only learn the audit process and mode independently, but also find and deal with abnormal situations in time through real-time monitoring [2]. In the audit implementation stage, artificial intelligence can be mainly used for the acquisition of audit evidence and the automatic generation of working papers. In addition to directly linking the audited entity's financial system, we can also use data mining and OCR technology to convert unstructured data into audit evidence that is easy to analyze. At the same time, combined with the continuous monitoring, real-time data recording and blockchain technology of artificial intelligence, the audit log can be generated automatically and regularly to reduce the risk of data tampering. In addition, the audit notice and letter of confirmation can be automatically generated by setting or automatically capturing the audit document template in advance. At the end of the audit, the audit report and rectification plan can be automatically generated according to the audit process and previous audit conclusions [3].

3.1. Data collection and verification based on OCR technology

The application of artificial intelligence based on OCR technology in audit can track business progress, quickly determine whether there is evidence of discipline violation and actively check. The main contents are as follows: check the illegal purchase, use OCR technology to identify invoices and product names, and auditors can verify the authenticity of the purchase through on-site interview and inventory. Use OCR technology to determine the invoice, product name and unit price, and convert them into excel text for comparison and filtering.

In addition, high-frequency transactions and non-standard procurement can be checked: first, the same business department continuously conducts multiple procurement checks from the same supplier. OCR technology is used to extract information such as product name and billing date to analyze product rationality. Secondly, check the purchase price of similar items. Use OCR to determine the invoice product name and unit price, output text to check the purchase price of similar products, and filter out similar products with large difference, which can be further verified in combination with on-site audit.

3.2. Data storage based on blockchain and distributed cloud storage

The distributed cloud storage system based on blockchain and cloud storage is jointly constructed by blockchain technology and cloud storage technology. The principle of distributed cloud storage system is to combine blockchain technology with cloud storage technology. Cloud storage technology provides storage space and stores real files, thus solving the problems of blockchain network storage resource waste and big data; Blockchain technology provides basic attribute information such as storage proof
and storage file summary, and uses the uniqueness and irreversibility of hash function to realize the verification area of data, so as to solve the problem of cloud storage data security [4]. The design architecture of distributed cloud storage system is shown in Figure 1. It is mainly divided into cloud storage layer, blockchain layer, protocol layer, management layer and interface layer. The core part is protocol layer and management layer.

Cloud storage layer is the underlying network of distributed cloud storage system and the underlying system for storing data. At present, Amazon simple storage service (Amazon S3) is widely used. Amazon S3 is an object storage service with good performance, scalability, security and data availability. A large amount of data will be distributed and stored on multiple servers in the nearby AWS area, which not only improves the security of data, but also facilitates data reading. Therefore, the cloud storage layer will choose Amazon S3 as the underlying network system to store real data. The blockchain layer is the authentication layer, which provides endorsement for real data, and uses hash function to realize data uniqueness and verifiability. Hyperledger is a commercial platform of blockchain. Its outstanding feature is pluggable design. Users can flexibly insert various functional modules to realize their desired blockchain network architecture. The good scalability of Hyperledger provides the basis for embedding cloud storage system. The protocol layer is the core part, mainly including security algorithm, consensus mechanism and so on. It includes the transmission protocol for managing file transmission, the distribution protocol for managing file distribution, and the consensus mechanism is practical Byzantine fault tolerance (PBFT) and DCP-ABE providing access control. The management layer manages the data stored in the distributed cloud storage system. It includes smart contracts that automatically trigger contract conditions, privacy protection management of public key and key formation, etc. These management functions need to be defined by users [5]. The interface layer is an access port designed to access the intelligent audit system. Distributed cloud storage system is the underlying system architecture of intelligent audit system based on blockchain and cloud storage. Its function is to provide data storage, ensure data security, basic data classification and basic data analysis, and provide a basic platform for building intelligent audit system.

3.3. Data analysis of audit robot based on neural network and RPA Technology

Neural network is very effective in solving big data problems. Machine learning combined with audit experience is an important part of modern artificial intelligence. Some researchers have developed logistic regression models and put forward some factors that can predict management fraud and its impact on auditors. Based on these factors, the neural network system can estimate the possibility of fraud in the audited financial statements.

Robot process automation (RPA) technology, as a workflow automation software that takes robot as virtual labor force and simulates the interaction process between human and computer to complete the expected tasks, can help auditors of accounting firms complete the work contents with high degree of
standardization, strong repeatability and heavy workload in the substantive process of main business income, it helps to improve audit efficiency, reduce audit cost and control audit risk.

4. Case analysis of the application of artificial intelligence in audit

The four major international accounting firms have made some explorations on Intelligent audit. For example, Deloitte launched the intelligent financial robot in 2017, and then launched an intelligent audit platform mainly for small and medium-sized accounting firms. On this platform, auditors can input audit data and requirements. The platform automatically analyzes audit risks and generates audit reports. Through the study of Deloitte's open case, it is found that it still follows the basic logic shown in Figure 2 in risk assessment and selection of response measures. However, in terms of data collection, it is basically entrusted to "artificial intelligence", which effectively improves the work efficiency. According to Deloitte, it has effectively reduced the time for reviewing legal contract documents, invoices, financial statements and minutes of board meetings by more than 50%.

![Figure 2. Audit plan chart](image)

Generally speaking, the application of artificial intelligence technology in audit can automatically collect, preliminarily process, analyze and monitor the involved business data and financial data according to the division and induction of various business types, automatically generate various prediction and emergency warning information, and provide clues and relevant data for the audited project. These measures help auditors to clarify the focus and scope of audit, scientifically arrange the annual audit work, reasonably allocate limited audit resources into the areas with great risks in the company's business, and realize the scientization, informatization and standardization of audit management.

![Figure 3. Key features of KPMG's AI review tool](image)
5. Development and challenge of artificial intelligence application in audit under the background of big data

At present, the research on the application of artificial intelligence in audit work is as follows: the applicability of artificial intelligence in specific audit tasks; Study the theoretical basis that can be used to understand the impact of artificial intelligence on audit; However, in the current economic environment, it is necessary to evaluate the impact of auditors on the experience of artificial intelligence systems. Firstly, it is necessary to clarify the future research of audit according to the professional level, so as to explore the impact of artificial intelligence system on the standard of audit results. Secondly, future research also needs to consider how internal auditors design and track artificial intelligence systems. Finally, evaluate the effectiveness of AI audit results, that is, whether the audit committee can accept the audit results obtained by auditors using artificial systems. From the perspective of big data, the application of artificial intelligence provides a new direction and driving force for the development of the audit industry. With the continuous progress of modern science and technology, the audit industry is also carrying out innovation and reform to eliminate the shortcomings of traditional audit work. It mainly has the following trends:

Point out the direction of audit: under the background of the continuous development of information technology, the data to be processed becomes more and more complex. Based on the perspective of big data, the application of artificial intelligence helps auditors find the key contents of massive data and point out the direction of audit, so as to better promote the audit work.

Provide data analysis for audit: in traditional engineering audit, the lack of data analysis technology will hinder relevant personnel from obtaining results based on a large amount of data, which is not conducive to the development of audit work. Based on the perspective of big data, the application of artificial intelligence provides data analysis functions for relevant personnel and performs basic audit work. For example, record the weather and climate conditions of the area to analyze and predict future weather changes and formulate countermeasures to reduce the impact on the project.

6. Conclusion

In the era of artificial intelligence, internal audit is no longer just checking errors and defects, but pays more attention to the overall enterprise development based on value creation and contributes to development and transformation. Artificial intelligence can use its own advantages to collect, analyze, summarize and analyze a large amount of data, and provide forward-looking audit recommendations from a higher, broader and more comprehensive perspective. By analysing the defects of traditional audit work and the effectiveness of the application of artificial intelligence in audit from the perspective of big data, this paper puts forward the direction for the future development of the application of artificial intelligence in audit.

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