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RESEARCH ARTICLE

A Big Data Stream-Driven Risk Recognition Approach for Hospital Accounting Management Systems

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ABSTRACT This work is confronted with hospital accounting management systems where business volume is usually large and trivial. While designing system prototype and processing algorithms, it is required to integrate realistic big data stream as the main factors for consideration. Because of such point, currently, there still lacks mature solutions for accounting risk recognition in such scenes. Combined with the micro service management technology of data flow, this paper puts forward the risk identification mode and cloud Data integrity verification algorithm for the purpose. Compared with traditional single user authentication techniques, this method has a significantly higher accuracy in hospital data analysis compared to comparative algorithms. At the same time, its error has been reduced. The multi-user parallel authentication algorithm further improves the computational efficiency of the authentication process while ensuring the integrity of data files and reducing the average time. Finally, we also make some empirical analysis on realistic data to testify performance of the proposed technical framework. The results show that the proposal is well suitable for digital risk recognition in hospital accounting management systems. And the recognition accuracy of the proposal can achieve 98%, and is about 22% higher than comparison methods.

INDEX TERMS Big data stream, risk recognition, accounting management, machine learning.

I. INTRODUCTION

Economic development and sci-tech innovation have driven the progress of the medical industry, and the speed of hospital construction is also accelerating [1]. However, with the increase of scale and quantity of people, there are various problems in hospital financial administration [2]. Financial administration informatization refers to the process of realizing data informatization in the whole chain and full coverage of financial administration, establishing a big data analysis system, and integrating and integrating financial information by mining various data resources [3]. It is expected to improve the level of financial administration and unit economic benefits in collaboration with other informatization modules [4]. The first problem solved by the application of computer network in financial administration is to further standardize the financial accounting of hospitals [5]. On the one hand, it can reduce unnecessary human errors in the accounting process, and effectively improve the work efficiency of hospital financial accounting [6].

Accounting informatization is essentially the restructuring of accounting business processes under the guidance of new accounting concepts. This is to better adapt to the needs of modern enterprise management and improve the efficiency and accuracy of accounting work. In this process, a modern Accounting information system characterized by integration and interaction has been established. This system integrates various accounting data and information, which can realize the automation and online of various accounting work and improve the efficiency and accuracy of accounting work. At the same time, this system can also be integrated with other enterprise information systems to achieve sharing and interaction of enterprise information, helping enterprises make better decisions and management.

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Therefore, accounting informatization plays an important role in improving the management level and competitiveness of enterprises. The most direct result of the application of computer network in financial administration is the establishment of a complete financial information system covering all departments of the hospital, which can effectively ensure the effectiveness, consistency and systematization of financial data.

When establishing a complete financial information system that covers all hospital departments, data components need to be provided [7]. The system needs to include financial data for all departments of the hospital, including income, expenses, assets, liabilities, profits, etc. To ensure the effectiveness of financial data, strict data validation and review processes need to be implemented. All input data needs to be validated and reviewed to ensure its accuracy and completeness. In order to ensure the systematic and procedural nature of financial data, it is necessary to establish sound financial processes and systems, including budgeting, accounting, analysis, reporting, etc. In addition, it is necessary to establish an interface between the financial information system and other hospital information systems to achieve automatic data transmission and integration. When establishing a financial information system, it is necessary to ensure the security of data. This includes data backup, recovery, and encryption. Through the above measures, the effectiveness, consistency, and systematicity of financial data can be ensured, thereby improving the efficiency and accuracy of hospital financial management.

The development of network and IT has brought revolutionary impact on hospital management methods, means and modes [8]. With the help of IT, hospital management has entered a new stage of information development [9]. In micro-architecture, business services become independent due to splitting, which can bring many benefits and help solve a series of problems in single architecture or service-oriented architecture. How to meet the needs of the market and the development of science and technology, and realize hospital information management is a major issue in hospital management. While IT brings great convenience to enterprises, its risks are obvious [10]. A series of problems, such as inadequate understanding of accounting informatization, blindly following the trend of hospital demand, imperfect management system, and lack of guarantee of data security, will cause huge hidden risks to the construction of hospital accounting informatization [11]. Combined with the micro-service management technology of data flow, this paper puts forward the risk recognition model and cloud data integrity verification algorithm in hospital accounting informatization construction, thus promoting the development of hospital accounting informatization [12].

The current hospital accounting management system poses the following risks:

1) Data security risk: A hospital accounting management system driven by big data streams needs to handle a large amount of sensitive data, such as patient personal information, medical records, etc. If data security protection is insufficient, it may lead to data leakage, tampering, or damage.
2) Technical risks: Due to the complexity of big data flow driven technology, the system may face technical risks such as technical failures, software vulnerabilities, and hardware failures.
3) Operational risk: Using a hospital accounting management system driven by big data streams requires professional operational skills and knowledge. Improper operation or lack of sufficient training may lead to operational errors or risks of misoperation.
4) Legal risk: Due to the large amount of personal privacy and medical information involved in hospital accounting management systems driven by big data streams, if relevant laws, regulations or industry norms are violated, legal liability risks may be faced.

In the informatization of hospital management, the informatization of financial administration plays an extremely important role in hospital operation and management decision-making and coping with the complex environment of market economy [13]. Through financial management informatization, hospitals can better grasp their financial situation, including expenses and income [14]. This enables hospitals to better control costs, reduce unnecessary waste, and improve operational efficiency [15]. Financial management informatization enables hospitals to quickly obtain financial data and conduct rapid analysis. This enables hospitals to make decisions faster and improve decision-making efficiency. Through financial management informatization, hospitals can better grasp patients' financial information, including medical expenses, drug expenses, etc. This enables hospitals to better meet the needs of patients and improve their experience [16].

Therefore, the informatization of hospital financial administration has always been the focus of realizing comprehensive informatization of hospital management. At the same time, due to the present situation, industry characteristics and professional requirements of hospital financial administration, the informatization of hospital financial administration has become a difficult problem in hospital management informatization. The purpose of financial administration informatization is not only to improve the efficiency of financial administration, but also to reconstruct the work flow through informatization and carry out ''process reengineering'', so as to improve work efficiency and increase benefits [17]. Based on the current situation of hospital financial administration information construction, this paper discusses the construction and operation of hospital financial management system with micro-service management technology of data stream. The research contains the following innovations:

1) This article proposes a risk identification model and cloud data integrity verification algorithm in the construction of hospital accounting informatization. In the sharing mode based on cloud computing, it has been

verified that the algorithm has higher computational efficiency than the single user verification algorithm. Compared with traditional single user authentication techniques, multi user parallel authentication algorithms further improve the computational efficiency of the authentication process. And it reduces the average time required to update each file while ensuring the integrity of the data files.

2) Through big data stream driven technology, massive hospital financial data can be processed in real-time, improving data processing efficiency and reducing delays in financial data processing. In the process of data collection, processing, and application, measures such as data encryption and permission control are adopted to ensure the security and integrity of hospital financial data, and to prevent data leakage and tampering.
3) Research and improve existing data flow driven microservice splitting methods, and improve the process of data flow information collection. This reduces the complexity of the data, improves learners' learning efficiency, and thus reduces training time.

This article introduces a typical machine learning algorithm for constructing regression for outputting risk identification results. Section I elaborates on the relevant background of cloud data integration verification algorithms for hospital accounting management systems, and analyzes the operation of big data streams in hospital accounting management systems. Section II cited relevant references for the popularity of big data management development. Section III conducted a contextual effect analysis. By analyzing some isolated links of accounting informatization, the risks of accounting informatization were accurately described and explained. And based on mathematical theory, a risk identification model was constructed. Section IV delves into the potential value of data through accounting information data mining and analysis tools. Provide more accurate and timely data support for hospital decision-making. Section V summarizes the entire text and indicates that the algorithm used has good risk identification effects.

II. RELATED WORK

Dealing with financial risks in the era of Big data requires breaking the boundaries of traditional data, algorithms and systems. More and more research has addressed these challenges and proposed new methods for risk detection, assessment, and prediction. In addition, Cheng et al. emphasized the importance of utilizing multi-channel information, charts, and long-term dependency networks to effectively identify financial risks. At the end of the investigation, the new challenges faced by the financial sector were discussed [18]. In the past decade, the information rich ship mobile data provided by the Automatic identification system (AIS) has been very popular. During this period, the use of satellite based receivers has achieved extensive coverage and improved data quality. The application of AIS data has evolved from simple navigation oriented research to include trade flow estimation, emission accounting, and ship performance monitoring [19].

Enterprises can introduce big data technology into existing enterprise management software to improve data processing capabilities [20]. For example, using big data platforms for data analysis and mining can quickly identify and predict financial risks [21]. The identification of corporate financial risks in the big data environment adopts a multidimensional data analysis model [22]. In addition to traditional financial indicators, emphasis is also placed on the analysis of non-financial indicators, such as market data and customer feedback [23]. Through multidimensional data analysis, enterprises can gain a more comprehensive understanding of their financial situation and identify potential financial risks [24]. The identification of corporate financial risks in the big data environment focuses on process analysis [25]. By monitoring and analyzing financial data in real-time, financial anomalies and potential risks can be identified in a timely manner [26]. Meanwhile, through big data analysis, future trends can be predicted, providing support for enterprises to formulate reasonable financial plans [27]. In summary, the identification of financial risks and information security control in the big data environment are issues that enterprises must attach importance to during their operations [28]. By introducing big data technology, multi-dimensional data analysis, real-time monitoring and analysis, as well as establishing a comprehensive data security management system, encrypting and backing up data, strengthening network and system security, and establishing emergency response mechanisms [29]. It can help enterprises better cope with the challenges in the big data environment, improve their competitiveness and sustainable development capabilities [30].

Sun et al. aim to elucidate the scope of BD and AI technologies in bridge SHM. Summarized BD and AI technologies, and summarized the requirements of bridge SHM for new technologies [31]. Tang and Karim discussed the application of Big data analysis in brainstorming sessions in current auditing standards. The author reviewed the literature related to fraud, brainstorming sessions and Big data, and proposed a model that auditors can follow by applying Big data analysis in different steps during brainstorming sessions [32]. Data mining technology can search for potentially valuable knowledge from a large amount of data, mainly divided into data preparation and data mining, as well as the expression and analysis of results. It is a mature information processing technology that utilizes database technology. Database technology is a software science that studies database management and applications. By studying the basic theories and implementation methods of database structure, storage, design, management, and application, data in the database is processed and analyzed [33].

Asaithambi has proposed a new hybrid architecture that combines Big data flow processing and batch processing to achieve intelligent computing of Microservices oriented

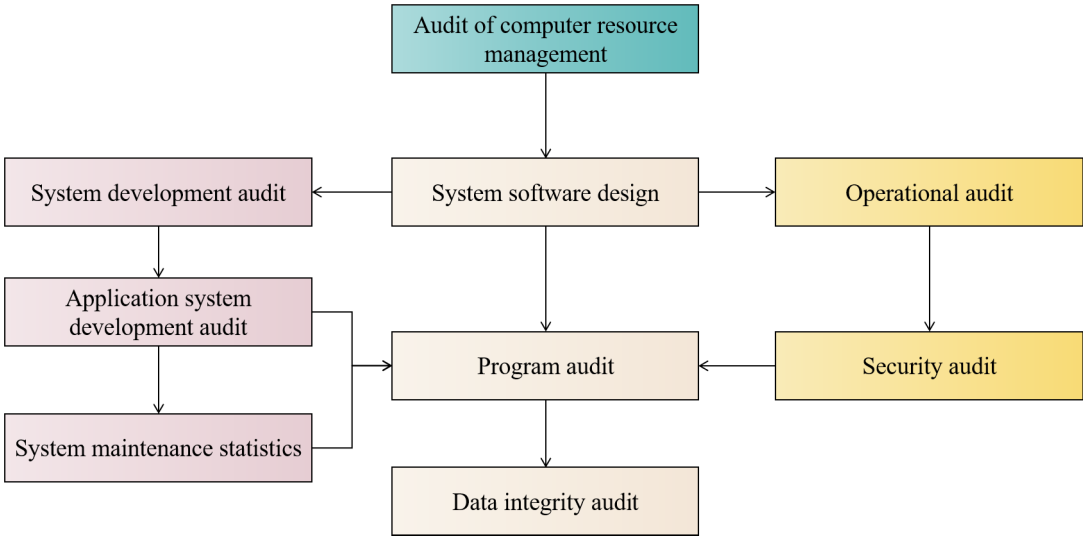

FIGURE 1. IT audit business content relationship.

transport indicators to meet the different needs of stakeholders. Developing such an architecture for intelligent transportation and analysis will improve the predictability of transportation supply for transportation suppliers and traffic management agencies, as well as increase consumer satisfaction during peak periods [34]. The manual data extraction and annotation workflow for converting conventional data into research data will be complex and inefficient. Typically, best practices for managing research data focus on data output rather than the entire data process from primary sources to analysis. In order to ultimately make the routinely collected data available for research, many obstacles must be overcome [35]. Ataei and Staegemann It aims to promote the development of data architecture and Big data system by applying the mature model of Microservices architecture to the Big data system. This goal is achieved through two systematic literature reviews and the injection of results through thematic synthesis. The result of this work is a series of theories that explain how the Microservices model is useful for Big data systems [36].

In the past two decades, desktop and server virtualization has played a positive role in the field of information technology (IT) [37]. Chatterjee ana Prinz extends security solutions using virtual private networks (VPNs), Blowfish and crypt (Bcrypt) hashing, encryption methods, API keys, network firewalls, and Secure Sockets Layer (SSL) to build digital infrastructure [38]. In the Internet of Things (IoT), technological development has increased the importance of joint cloud systems and integrated cloud providers for exchanging transactions. The implementation of a service-oriented architecture (SOA) in a single chip IoT system is complex for supporting scalability and communication transactions in federated cloud systems [39]. In order to effectively deploy delay sensitive and bandwidth scarce IoT application services, the edge computing paradigm uses distributed and resource constrained devices around the network. On the other hand, because of its maintainability and scalability advantages, Microservices architecture is increasingly popular in the development of Internet of Things applications [40].

Li et al. used cloud computing and other technologies to build a Accounting information system with Big data analysis as the core [41]. Durocher et al. analyzed the legitimacy management and bottom-up socialization process within accounting companies [42]. Figge et al. believe that enterprise informatization refers to the application of advanced IT and modern management science to optimize the product life cycle, including market demand analysis, product definition, R & D, design, manufacturing and service [43]. The goal of informatization is to make manufacturing enterprises more flexible, stronger and more adaptable, and finally gain market competitiveness. Mr, etc. think that enterprise informatization is the use of IT to realize the electronization and digitization of all business processes such as enterprise R & D, production, sales and service, enhance the circulation capacity and knowledge conversion rate of enterprise information resources, improve the efficiency of enterprise operation and decision-making ability, and enhance the rapid response capability and strategic flexibility of enterprises [44]. Appelbaum et al. put forward a category incremental learning algorithm to deal with the financial situation of enterprises by updating the classifier [45].

As the hospital is a special social responsibility to maintain people's health, the informatization level of hospital financial administration is directly related to people's life safety and the ability of hospital medical services to meet people's growing health care needs in the information age, so the informatization construction of hospital financial administration is of great social significance. Vasconcelos et al. analyzed the problems of system planning, information security,

training of information professionals and information standards in hospital information construction, and put forward corresponding solutions [46]. Bazzoli outlined the system design and implementation scheme of hospital information management system based on Web Service, and introduced N-tier architecture pattern into the design practice on the basis of UML modeling, which greatly improved the performance of system response speed, system load function and system scalability [47]. Levit has constructed a multi-level and comprehensive system from three dimensions: information, technology, and management. This system conducts information analysis based on the current situation of the hospital, achieving comprehensive optimization of hospital information technology and improvement of management level [48].

Carey analyzed the focus contradiction between information management level and hospital management requirements in the practice of hospital informatization, and put forward constructive countermeasures such as reasonable layout, strict control, scientific demand analysis and establishment of long-term maintenance mechanism [49]. Avraham et al. discussed the necessity and important role of hospital financial management, the development strategy of hospital financial management system and the specific measures of information construction [50]. Hospital financial informatization, like other medical institutions or industries, faces the need to improve efficiency, reduce costs, and improve information accuracy. In addition, hospital financial informatization also needs to consider the particularity and regulatory requirements of the medical industry. Secondly, in the implementation of hospital financial informatization, the successful implementation experience of other medical institutions or industries can provide many useful references. The financial management systems of other industries such as retail and finance can also provide useful references for hospital financial informatization.

Spekle et al. believes that the current hospital financial management needs to take effective measures to improve and perfect the talents, planning, system compatibility and standard formulation [51]. Malmquist put forward some targeted measures, such as strengthening the training of compound talents in financial and information management, optimizing financial administration process, improving the layout of financial administration system, standardizing financial administration data and integrating various systems of hospital information management [52].

III. METHODOLOGY

A. ANALYSIS OF CONTEXTUAL EFFECT

With the improvement of medical system in recent years, hospital construction and medical facilities have been strengthened. In order to adapt to this development mode, a series of changes are taking place in hospital working system and management means. All work in the hospital is closely related to financial administration. In addition to paying salaries, bonuses, insurance, etc. for hospital staff, financial administration should also manage and adjust the financial work of outpatient, emergency, check-up, hospitalization, refund and other projects [53].

ROI is an important consideration when investing in hospital financial informatization. ROI refers to the ratio of the benefits of investing in a project to the costs incurred. When conducting cost-benefit analysis, the initial investment cost includes hardware, software, training, and other expenses. The operation and maintenance costs include system upgrades, maintenance, data storage, and other expenses. Human resource costs include employee salaries, training, and other expenses. Benefits include improving work efficiency, reducing errors, and improving patient satisfaction. By comparing the costs and benefits of financial informatization projects with traditional financial management methods, the long-term benefits of financial informatization can be highlighted. At the same time, it can also improve patient satisfaction, thereby increasing income. Therefore, financial informatization is a high ROI investment that can bring long-term cost-effectiveness to hospitals.

Although the practice of hospital financial informatization has played a certain role in promoting the efficiency of hospital financial administration and the improvement of the whole hospital operation management, in the existing practice of hospital financial informatization, due to the limitations of theoretical and practical experience accumulation, there are many drawbacks, such as unclear positioning of hospital financial informatization management, insufficient integration with hospital-specific business processes and management requirements, imperfect financial informatization management talents and technical support, repeated investment and slow update of hospital financial informatization construction, and so on. All the above-mentioned work leads to a very complicated financial administration work in hospitals, which not only has a huge workload, but also increases the staff's error rate, prone to settlement problems, and easily exploited by some illegal personnel, thus deducting money from them through management loopholes, causing huge economic losses to hospitals [54].

These problems and the existence of this situation have seriously restricted the in-depth development of hospital financial information construction and the function of related information management system, and become a prominent bottleneck in the informatization construction of Chinese hospitals at present. The deepening development of hospital financial informatization construction and the functionality of related information management systems are severely constrained due to multiple factors. Firstly, the construction of hospital financial informatization needs to take into account the particularity and regulatory requirements of the medical industry. This requires hospitals to take special measures and technical means when implementing financial informatization, which increases the difficulty and cost of implementation. Secondly, hospital financial informatization needs to be integrated with other hospital information systems. This requires the hospital to carry out overall

planning and design of informatization, ensuring the accuracy and reliability of data sharing and interaction between various systems. In addition, hospital financial informatization also needs to consider data security and privacy protection.

The financial data system should be able to accurately record and report financial data, including income, expenses, assets, and liabilities. The accuracy of data is the foundation for ensuring financial stability and correct decision-making in primary healthcare institutions. The financial data system should be able to fully record and report all financial activities related to primary healthcare without any omissions or concealments. The integrity of data helps to prevent resource waste and abuse, as well as to identify and solve potential financial problems. Financial reports should express financial information in a clear and intuitive manner, making it easy for managers and other stakeholders to understand. The report should include key financial indicators, such as profit margin, balance of payments, cash flow, etc., to help decision-makers comprehensively understand the financial situation of the institution.

Therefore, it is need to improve the hospital financial administration, introduce the computer system, digitize the hospital financial work, unify the data and information, improve the working efficiency of financial administration personnel and ensure financial security. When discussing the popularization of the internet and the integration of IT and hospital management, IT auditing is an indispensable part. IT audit is an independent security and risk assessment process aimed at identifying, evaluating, and resolving issues and potential risks related to hospital information management systems. In this process, auditors need to conduct a comprehensive inspection and evaluation of the hardware, software, and related information system environment of the hospital information management system to ensure the security, reliability, and compliance of the system.

Unifying data and information can ensure data consistency and accuracy among various systems in hospitals. This can avoid issues such as data duplication and data conflicts, ensuring data integrity. Unified data and information can facilitate hospital employees to access and obtain the necessary data and information anytime, anywhere. With the popularization of network and the continuous integration of IT and hospital management, the business scope related to information system is becoming wider and wider. IT is far from enough to understand IT audit as the audit of hardware and software, and it must be combined with the related information system environment and related business. When conducting IT audit, you must be familiar with the business content of the IT audit object, and define each item of IT audit and its measurement standard. The contents of IT audit business and their relationship are shown in Figure 1.

B. RISK RECOGNITION MODEL

Risk recognition is an important way for hospitals to master the risk information of accounting informatization, determine the risk level, and decide whether and how to strengthen risk control. The risk evaluation of hospital accounting informatization is a complicated process. It can't accurately describe and explain the risk only by analyzing some isolated fragments of accounting informatization. In the process of risk recognition of hospital accounting informatization, because various factors have different influences on hospital accounting informatization, a well-structured risk recognition method must be used to reflect this difference. The hospital financial system must have basic data in order to operate normally. The basic data is an aggregate, and all other basic data in the system are contained in it. When users input documents or credentials, they need to input relevant basic business information. The basic data design section mainly includes the setting of accounting subjects, coin types, calculation methods, etc.

In each sample $X_i \in S_{\min}$ in the minority class sample $S_{\min}$, find the k nearest neighbors of this sample, and then randomly select a point Y_j from the k nearest neighbors. Calculate the difference between the feature vectors corresponding to the samples X_i and Y_j, and then generate a random number between 0 and 1 to synthesize a minority class sample X_{new} as:

$$X_{new} = X_i + \left(X_i - Y_j\right) \times \delta \tag{1}$$

This formula explains how to calculate the difference between features in a few samples and generate a class sample of random numbers. It describes the process of generating artificial samples by minority groups. If the 'k' value is too small, the distance between the nearest neighbors will be too close, resulting in the generated samples being too sparse to capture the distribution characteristics of minority class samples. On the contrary, if the ''k'' value is too large, the distance between the nearest neighbors will be too scattered, resulting in the generated samples being too dense and losing representativeness. Therefore, selecting an appropriate 'k' value is crucial for the effectiveness of minority class sample generation methods. If the ''k'' value is not selected properly, this method may cause overfitting or underfitting problems, thereby affecting the generalization ability of the model.

Real-time trend analysis of data streams is based on the real-time segmentation of continuously arriving data streams, that is, the time series data sequences are segmented in real time according to a certain statistical characteristic index, so that the data sequences in the segmented data segments obey the same statistical model, while the adjacent segments obey different statistical models, so that the trend characteristics of each data segment can be characterized by the statistical indexes. When it comes to data sequences within each segmented data segment following the same statistical model, a possible example is time series data. In this case, each data segment can represent data over a period of time. The data series within each time series data segment can follow the same time series model, such as ARIMA model or STL model. When it comes to adjacent data segments following different models, a possible example is classified data. Each data segment can represent a category

or part of a category, such as text classification or image classification. In this case, each data segment can follow a different classification model, such as Support Vector Machine (SVM) or Decision Tree. Remember that the one-dimensional real-valued data stream that keeps arriving is:

$$X = \{x(t_1), \ldots, x(t_i), \ldots, x(t_c), \ldots\} \tag{2}$$

where t_c is the current moment. Data stream segmentation is the segmentation of X into a series of consecutive non-empty data segments $\{X_1, \ldots, X_j, \ldots, X_s, \ldots\}$, where:

$$X_j\left\{x\left(t_{j,1}\right), \ldots, x\left(t_{j,l}\right), \ldots, x\left(t_j, n_j\right)\right\} \subset X, \quad j = 1, 2, \ldots, s \tag{3}$$

$$t_{j,l} \in \{t_1, \ldots, t_i, \ldots, t_c, \ldots\}, t_{j,l} < t_{j,l+1}, \quad l = 1, 2, \ldots, n_j \tag{4}$$

And the first data element $x\left(t_{j,1}\right)$ and the last data element $x\left(t_{j,n_j}\right)$ in the X_j are respectively adjacent to the last data element $x\left(t_{j-1,n_{j-1}}\right)$ in the X_{j-1} and the first data element $x\left(t_{j+1,1}\right)$ in the X_{j+1}. The n_j is the data sequence length of X_j. The X_s is the data segment containing the current data $x(t_c)$, which is called the current data segment. Let the data in X_j be described by a linear regression model:

$$x(t) = f\left(t, \theta_j\right) + \varepsilon_j(t), \quad t \in \left\{t_{j,1}, \ldots, t_{j,n_j}\right\} \tag{5}$$

The linear regression model corresponding to data segment X_j is:

$$f\left(t, \theta_j\right) = a_j t + b_j \tag{6}$$

The model parameter vector is:

$$\theta_j = \left[a_j, b_j\right]^T \tag{7}$$

Trend eigenvalues (aj) are a very important part as they can be used to characterize the trend characteristics of each data segment. Trend eigenvalues refer to the trend or pattern of data over time within a time series data segment. These trend characteristic values can be determined by calculating the difference between each data point in the data segment and the average value of that data segment.

The linear regression model parameter a_j is called the trend eigenvalue of X_j. The first data element $x\left(t_{j+1,1}\right)$ of the X_{j+1} is called the split point of the X_j. Design your own private database for each microservice. Other microservices need to access the data in the database through the interface exposed by microservices, so as to achieve data isolation. The design of a single database also makes it need to expand the whole database every time a service is expanded, which reduces the scalability of the service. In addition, the single shared database in a complex single system is often huge, which will pose a certain challenge to the improvement of system performance. In the process of migrating to microservices, it is need to consider the interaction between business operations and data to support the splitting of microservices.

Hospital accounting informatization is also a whole, so its risks are closely related to all factors that may cause risks, and different risks are reflected in the combination of different risk influencing factors. There are many factors influencing the risk of hospital accounting informatization. They are not isolated in the whole of hospital accounting informatization, but interrelated, mutually restricted and coordinated, which jointly contribute to the emergence of risks. According to the system theory, each component of the system is interrelated and interacted with each other, and at the same time, it is interrelated and restricted with other things and systems. In other words, there is no completely closed system that has nothing to do with other things and systems.

The risk identification model proposed in this article can effectively identify potential risks in the process of hospital accounting informatization. By analyzing the characteristics of hospital accounting data, this article designs a cloud data risk identification model that can efficiently identify the main risks in hospital accounting informatization. The application of this model can help hospitals detect and prevent potential risks in a timely manner, reducing risks in data security and privacy breaches. Secondly, the cloud Data integrity verification algorithm proposed in this paper can effectively verify the integrity of hospital cloud data. Due to the importance of hospital accounting data, ensuring the integrity and accuracy of the data is crucial. The algorithm in this article verifies the integrity of the data by comparing its hash value with historical data. This method can not only be applied to hospital accounting data, but also to the integrity verification of other important data.

The system theory especially emphasizes the relationship and function between the whole and parts. It holds that if the components, relationships, ways and structures of the components of the whole are changed, the nature and status of the whole will also change accordingly. Financial sharing breaks the restriction of geographical location and time, manages hospital finance in a unified way, and puts relevant financial information on the network to realize data sharing. This needs the support of advanced accounting information construction, especially the accounting information security under the financial sharing mode, which needs special attention.

C. CLOUD DATA INTEGRITY VERIFICATION ALGORITHM

The essence of accounting IT is to simplify accounting work through Internet technology and computer network technology, which saves many unnecessary steps, such as the collection and collation of accounting information and the sorting and collation of accounting vouchers. The application of cloud data integrity verification technology in hospital accounting practice has solved this problem well, and the accounting cloud data integrity verification technology itself has special accounting file confidentiality technology. The setting of confidentiality procedure reduces the risk of hospital accounting work, and also plays an escort role in the normal operation of the hospital.

The implementation of accounting cloud Data integrity verification technology requires the purchase or development

TABLE 1. Accuracy before and after feature selection.

	quantity of features	Accuracy	Training time
Data before feature selection	70	75.91%	0.0469
Data after feature selection	8	82.16%	0.0411

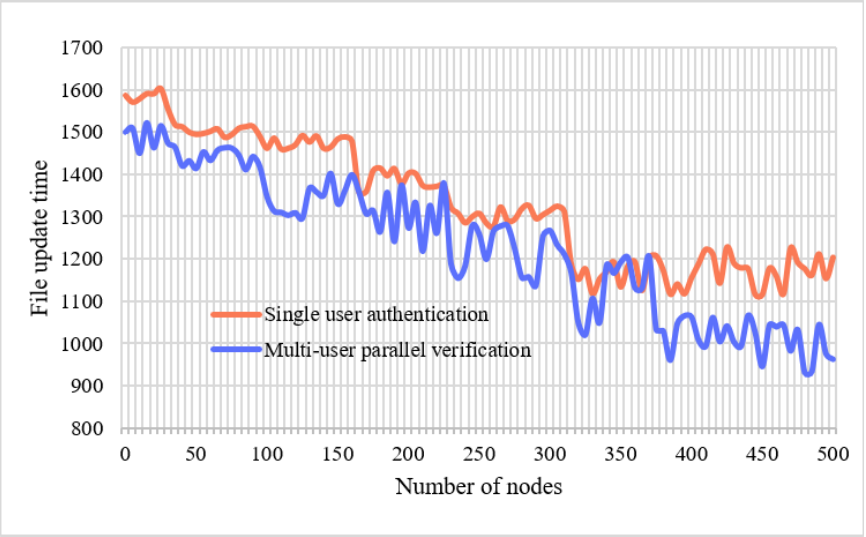

FIGURE 2. Algorithm performance comparison.

of relevant software, hardware and tools, which may lead to certain initial investment costs. In addition, it is necessary to pay for technical support and maintenance to ensure the normal operation of the system. It may cost some to train employees to use and maintain the accounting cloud Data integrity verification system. This includes training employees on how the system works, how to collect and organize data, and how to perform validation. Implementing the accounting cloud Data integrity verification technology may take some time to develop and deploy the system, and test and debug it. This may have an impact on the daily work of the organization, requiring a reasonable arrangement of time and resources.

Accounting cloud Data integrity verification may need to process sensitive financial and patient data, so strict data security and privacy protection measures need to be taken to ensure data security and confidentiality. This may require additional safety equipment and procedures, as well as employee training and management measures. The accounting cloud Data integrity verification system may need to be integrated and interoperated with other existing systems to ensure data integrity and consistency. This may require the development and configuration of corresponding interfaces and technical support.

Hospital financial administration information system is a comprehensive system aiming at the informationization of hospital financial administration. At the present stage, although cloud data integrity verification technology has been gradually applied to all aspects of Chinese people's life and work, people generally don't know the concept of cloud data integrity verification technology clearly. Therefore, people can't distinguish between information planning technology and other technologies. In hospital accounting practice, such a situation will also occur. The person in charge of the hospital's accounting organization or the cross-level supervisor has insufficient knowledge of the accounting cloud data integrity verification technology, and the role and application of this technology are unclear.

TABLE 2. Parameter optimization accuracy.

Error penalty parameter	Gauss parameter	Accuracy
0.25	0.1	68.5%
0.25	1	69.8%
0.25	10	79.6%
0.5	0.1	65.4%
0.5	1	65.8%
0.5	10	66.9%
1	0.1	79.4%
1	1	82.5%
1	10	75.2%
2	0.1	75.1%
2	1	69.4%
2	10	68.7%
4	0.1	62.9%
4	1	68.4%
4	10	69.4%

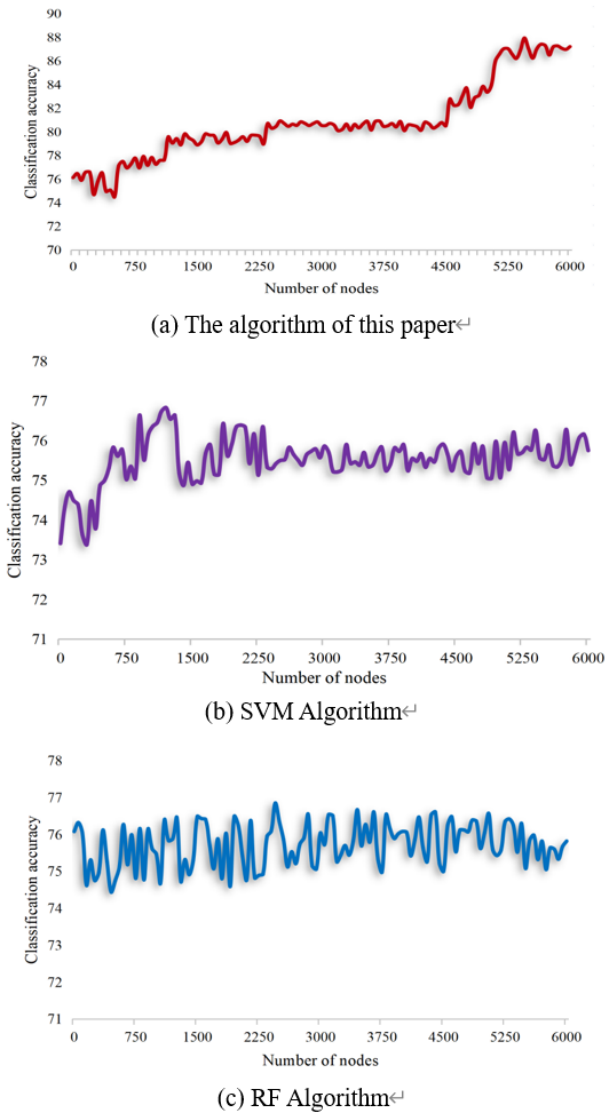

FIGURE 3. Classification accuracy of different algorithms in hospital data flow microservice management.

A matching secret key is generated for all users and stored in a third-party trusted verification authority. Let the file signature of each file block in the verification file $F = (m_1, m_2, \ldots, m_n)$ be:

$$\sigma_i = \left(H(i) \cdot u^{m_i}\right)^x \tag{8}$$

where $H(i)$ represents a hash function, and x and u are both random numbers. A sequence of validation requests is generated for each file block, expressed as follows:

$$CHAL = \{(i, v_i)\} \tag{9}$$

where i is the serial number of the file block, and v_i is the corresponding random number. Multi user parallel authentication is an authentication method that improves authentication efficiency and security by simultaneously authenticating multiple users. This method can verify the identities of multiple users at the same time, thereby accelerating verification speed and improving system performance.

In order to achieve multi-user parallel authentication, it is need to complete the grouping and merging of all user files:

$$\mu_k = \sum_{i=1}^{n} v_i m_{k,i} + \mu_r \tag{10}$$

where μ_r represents the random number generated by the cloud storage server for each user during each verification process. Compute the signature:

$$\sigma = \prod_{k=1}^{K}\left(\prod_{i=1}^{n} \sigma_{k,i}^{v_i} \cdot r_k\right) \tag{11}$$

where $\sigma_{k,i}^{v_i}$ represents the digital signature of a single file, $r_k = \mu_k^{\mu_r}$. Complete the result verification of grouping and merging, and judge whether the cloud storage is correct.

Error correction can be deduced by solving linear system equations:

$$S_j = \sum_{k=1}^{v} Y_k X_k^j, \quad j = 1, \ldots, n-k \tag{12}$$

The error value Y_k can be determined by:

$$X_k = \alpha^{i_k} \tag{13}$$

It can be also accompanied by:

$$S_j = R\left(\alpha^j\right) = e\left(\alpha^j\right) = \sum_{k=1}^{v} e_{i_k}\left(\alpha^j\right)^{i_k}, \quad j = 1, \ldots, n-k \tag{14}$$

The α^{i_k} and e_{i_k} are corresponded to X_k and Y_k respectively. Then, following formula can be deduced:

$$S_j = R\left(\alpha^j\right) = e\left(\alpha^j\right) = \sum_{k=1}^{v} Y_k (X)_k^j, \quad j = 1, \ldots, n-k \tag{15}$$

In the formula, X_k gives the wrong position and Y_k gives the wrong value.

Data stream is a kind of complex data object, and establishing a proper and reasonable model is the basis of analyzing and mining data stream, so data stream mining needs to establish a data stream model first. After the data stream model is established, because the data stream has the characteristics of continuous and high-speed arrival of massive data, in order to mine the data stream in real time, speed up the processing speed and reduce the memory resource occupation, the data stream data can be reduced by dimensionality reduction or data stream summary extraction.

IV. RESULTS ANALYSIS AND DISCUSSION

A. RESULTS ANALYSIS

There are 8 feature subsets selected by the algorithm, 72 less than the original 70 financial indicators, which greatly simplifies the data. The training set is used to train the data

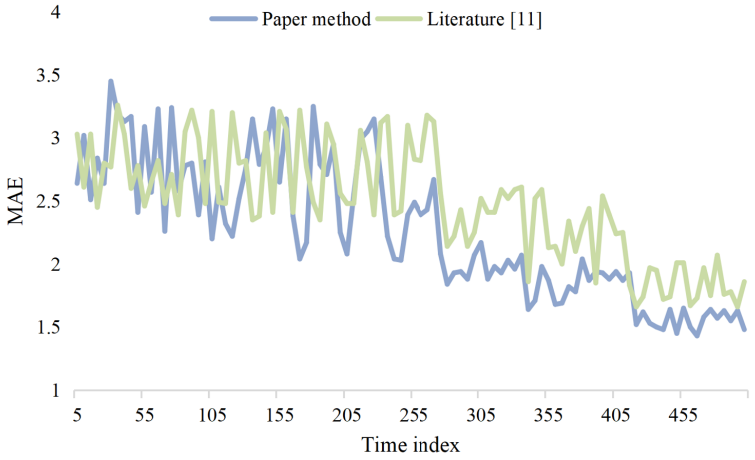

FIGURE 4. Accuracy comparison.

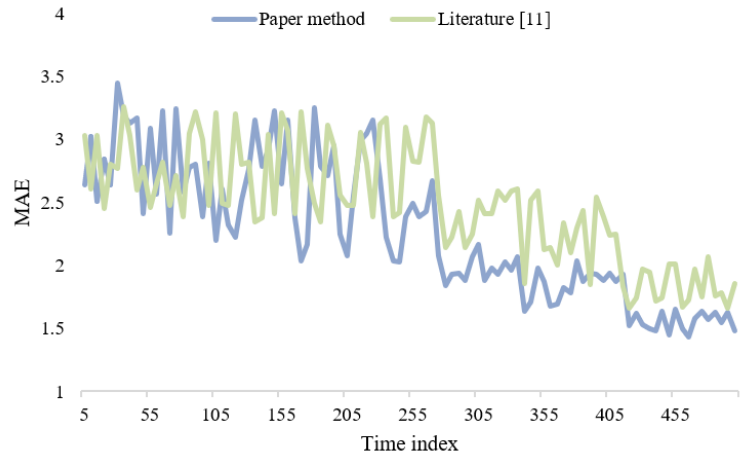

FIGURE 5. Comparison of mean absolute errors.

before feature selection and the data after feature selection, and the test set is used to test. The specific results are shown in Table 1. According to the results in Table 1, it can be clearly found that the accuracy of feature set after feature selection has increased by 6.25%, and there are 8 feature subsets after feature selection, which are much less than the original feature set. This reduces the data complexity, improves the learning efficiency of the learner, and therefore reduces the training time.

Grid search provides a set of parameter error penalty parameters and Gaussian parameters in each training. The estimated value of the whole training set is obtained by averaging the accuracy of the classified data, and the obtained results are shown in Table 2. It can be seen from Table 2 that the combination data volume segmentation method can gradually obtain an ideal parameter combination. Some hospitals that have not set up relevant accounting archives custody institutions arrange special personnel to keep them. As a result, the custody of accounting archives is handed over to many people or one person, which inevitably leads to the omission of confidentiality, which leads to the leakage of accounting archives in hospitals. The performance comparison results of data integrity verification algorithm are shown in Figure 2.

It can be seen that with the increase of the quantity of nodes in the cloud computing environment, the average time required for updating each file in the traditional single-user authentication algorithm remains the same, but the average time required for updating each file in the multi-user parallel authentication algorithm will gradually decrease. Therefore, in the sharing mode based on cloud computing, the parallel verification algorithm has higher computational efficiency than the single-user verification algorithm. The classification accuracy of different data verification algorithms in hospital data stream microservice management is shown in Figure 3. For the accuracy of the training model, the size of the samples may also have a certain influence. Under the ratio of the quantity of two categories of 1:1, training models with

TABLE 3. Effect of sample size on model accuracy.

Total sample number	quantity of samples per class	Accuracy	Training time/second
15	5	68.95%	0.0315
25	15	70.1%	0.0319
45	30	70.1%	0.0338
65	45	76.5%	0.0396
85	60	77.9%	0.0425
105	75	78.4%	0.0455
125	90	76.2%	0.0478

different quantity of samples are used for testing. The specific results are shown in Table 3.

It can be found that when the quantity of samples reaches a certain level, the classification accuracy will be improved, while when the quantity of samples is too small, the classification accuracy will be greatly reduced. At the same time, with the increase of the quantity of samples, the training time will also be improved. Comparing the accuracy and average absolute error between the accounting risk recognition model in this paper and the model in reference [44], the results are shown in Figure 4 and Figure 5. The accuracy of this method in hospital data analysis is significantly better than that of comparative algorithms, with higher accuracy. At the same time, its error has been reduced. Therefore, applying this method to the construction of hospital accounting informatization is of great significance.

B. DISCUSSION

In the practice of hospital accounting, it is very important to enhance the awareness of accounting informatization. With the intensification of competition in the medical industry, hospitals need to adopt modern management methods to improve efficiency and reduce costs. Accounting informatization is an important part of modern management, which can help hospitals achieve functions such as data sharing, real-time monitoring, and decision support. Hospitals can establish an accounting informationization leadership group. Establish an accounting informationization leadership group composed of hospital leaders and department heads, responsible for formulating accounting informationization planning, implementation, and supervision. Hospitals need to train existing employees to equip them with the skills to use and maintain accounting information systems.

At the same time, we will introduce talents with experience and skills in accounting informatization to provide support for the development of hospital accounting informatization. Hospitals need to choose accounting information systems that are suitable for their own business needs. When selecting a system, it is necessary to consider its stability, scalability, and ease of use. Hospitals need to establish standards for data standardization and integration to ensure consistency in data format and exchange between different systems. Hospitals need to continuously improve and upgrade their accounting information systems to meet constantly changing business needs and technological developments. Through the above measures, hospitals can better accept and adopt accounting informatization, improve efficiency and reduce costs, thereby maintaining competitiveness and efficiency in fierce competition.

In summary, cloud Data integrity verification is a technology to verify Data integrity, but there are still some limitations. First, cloud Data integrity verification algorithm can only verify the integrity of data during transmission and storage, but cannot verify the integrity of data during processing. Secondly, cloud Data integrity verification requires a certain amount of computing and communication resources, which may affect the performance of the system. Finally, cloud Data integrity verification calculation may also have security vulnerabilities, which cannot fully guarantee the security of data. The risk identification model and cloud Data integrity verification calculation in the construction of hospital accounting informatization need high technical support, but the current technical level of hospital accounting informatization is limited, which may not meet the actual needs.

V. CONCLUSION

From the current development trend of China's accounting and informatization, accounting cloud data integrity verification technology will be the main development trend of China's accounting practice in the future. Accounting informatization has a far-reaching impact on promoting the optimization and renewal of hospital financial administration. It will also have practical significance to apply accounting informatization reasonably in accounting affairs. Therefore, this paper will focus on the impact of accounting informatization on hospital accounting practice and its countermeasures. Combined with the micro-service management technology of data flow, this paper puts forward the risk recognition model and cloud data integrity verification algorithm in hospital accounting informatization construction, and verifies the effectiveness of the methods, thus promoting the development of hospital accounting informatization.

The results show that, compared with the traditional single-user authentication technology, the multi-user parallel authentication algorithm further improves the computational efficiency of the authentication process and reduces the average time required for updating each file on the premise of ensuring the integrity of data files. Compared with the

traditional methods, the risk recognition model in this paper improves the accuracy by 22.65% and reduces the error by 46.38%. Therefore, it is very meaningful to apply this algorithm to hospital informatization. In the future social development, Chinese hospitals need to conform to the social development, keep up with the pace of social development, face all kinds of challenges posed by informatization to hospital accounting practice with a correct vision, and further optimize and perfect the institutional system in hospitals by improving the awareness of accounting informatization in hospital accounting practice.

Although the informatization construction of hospital accounting has brought many benefits, there are also some risks and limitations in its process. For risk identification models, potential limitations include: due to the large and complex amount of data, there may be risks such as data entry errors, data omissions, or data tampering. There may be some assumptions and simplifications in model design, which may lead to deviations or errors in the results. In the future, the following measures can be taken: by improving data processing capabilities, reducing issues such as data entry errors and omissions. By optimizing the design of the model, the accuracy and precision of the results can be improved. By improving and perfecting the algorithm, the accuracy and reliability of the prediction results are improved.

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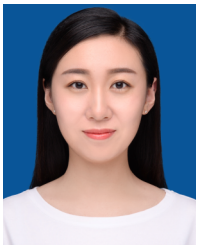

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