Research Article

Rural Financial Mobile Service Management System Based on Big Data

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Aiming at the problems of poor functionality, low resource utilization, and long response time in the currently designed rural financial mobile service management system, a rural financial mobile service management system based on big data is designed. This paper discusses the ideas and characteristics of big data, as well as the functional needs and development viability of rural financial mobile services. Based on Hadoop’s big data technology and MapReduce and Spark, a big data analysis service management system architecture that is suitable for the field of rural finance is designed. Based on the overall system architecture, which is combined with linear discriminant analysis and data mining algorithms, the system software architecture is designed to realize system functions. Model the database in the system design process through power designer, and then realize the design of the rural financial mobile service management system based on big data. The experimental results show that the proposed method design system has better functionality, can effectively improve the utilization of system resources, and shorten the system response time.

1. Introduction

Internet finance is a new financial form of Internet technology combined with finance. The rapid update of various Internet levels, the extensive use of information technology, big data payment methods, and social media have brought a great impact on the banking industry [1]. Under the background of the Internet, the transmission, updating, and processing speed of information is very fast. To a certain extent, it reduces the transaction cost caused by information asymmetry and makes Internet financial services more and more economical and effective [2]. At this point, expanding rural financial mobile services has become a critical demand for improving the new countryside and the foundation for its construction. Rural financial mobile services are also gradually developing in a reasonable and standardized direction. With the application of big data technology, rural financial mobile services will be further improved. Farmers have a new understanding of financial mobile services and stricter requirements for financial products. Traditional and backward financial services will not meet the development of the rural economy [3]. Because of the unique position of the rural economy in the national economy and the central role of finance in the economy, it is critical to investigate the management of rural financial mobile services to address rural financial issues.

At present, the research on financial service management systems has also made great progress. Reference [4] designed a supply chain financial service management system based on blockchain Internet of things data sharing and edge computing. Supply chain financing and blockchain technology are analyzed. Combined with the specific situation of blockchain in supply chain financing, the supply chain management system, cash flow, and risk control system are analyzed. While reducing business costs and improving enterprise efficiency, supply chain financing parties have optimized the supply chain financing risk control system and greatly reduced the risks of supply chain financing parties. The blockchain Internet of things environment based on shared data and advanced data processing has very strong theoretical and practical significance for promoting the development of commercial banks and enterprises.
Reference [5] designed an integrated personal financial management system for managing cash flow. This study involves providing computing services for consolidated financial data associated with users and metrics indicating users’ performance in their savings. The FLO service system can receive financial account-based information associated with the user and link the information to the user’s user profile.

Information based on financial accounts can be used by the FLO service system to obtain financial transaction data from various financial accounts of users. Financial transaction data can be used to dynamically generate one or more metric values, which can be dynamically determined and displayed on various time frames to provide a picture of the user’s financial health. The FLO system can also interact with financial advisors. However, the above methods still have the problems of poor system functionality, low resource utilization, and long response time. To solve the previously mentioned problems, a rural financial mobile service management system based on big data is designed. By analyzing the functional requirements and development feasibility of rural financial mobile service management systems, the architecture of rural financial mobile service management systems is designed based on Hadoop’s big data technology. Combined with linear discriminant analysis and data mining algorithm, the software architecture of rural financial mobile service management system is designed, and the database in the process of system design is modeled to realize rural financial mobile service management. The proposed method has good functionality and high resource utilization and can effectively shorten the system response time.

The rest of the paper is organized as follows. Section 2 discusses big data technology, Section 3 discusses rural financial mobile services, Section 4 discusses demand analysis for a rural financial mobile service management system, Section 5 discusses rural financial mobile service management system design, Section 6 discusses system test results and analysis, and Section 7 discusses conclusion.

2. Big Data Technology

2.1. Concepts and Characteristics of Big Data. Big data analysis is the process of analyzing and processing large amounts of data to extract useful information from it. This is a kind of data that can be collected, sorted, managed, analyzed, and supported for operation and production within the specified time [6]. Big data technology is a related technology to collect and process data from the aspects of dynamic development, timeliness, economy, and so on. Big data has 4V characteristics as follows:

(1) Volume: It means that the data volume presents TB, Pb, EB, ZB, and other standards and is still rising. It is difficult to calculate and store them within the standard range.

(2) Velocity: It refers to the dynamic and rapid data flow in the process of data flow, including stream mode, real time, quasi-real time, or batch mode.

(3) Variety: Data includes structured, semistructured, and unstructured data types (log, text, image, voice, etc.).

(4) Value: From the value embodied in the data, it has the characteristics of low-value density and high commercial value.

From the 4V characteristics of big data, we can see that big data has a large amount of data, including structured and unstructured data, and the data processing speed is required to be fast, but its value density is low, fragmented, and highly discrete.

2.2. Big Data Technology Based on Hadoop. Hadoop is a collection of technologies and tools. After years of development, the key applications in the Hadoop technological system are now reasonably excellent in the open-source community [7].

Map Reduce is the core component of Hadoop. It is a parallel programming architecture. Map Reduce is specially used to solve the application problems of parallel analysis and operation in large-scale dataset scenarios. The source of the name Map Reduce is determined by its two core processes: one is the mapping process Map, and the other is the inductive process Reduce [8]. The Map-Reduce running framework is as shown in Figure 1.

Map Reduce will execute these processes concurrently on a series of work nodes. Each node uses the same code to process its own managed data without information interaction. Map-Reduce makes developers no longer consider the underlying details when developing large-scale data processing applications, but only realize the corresponding interfaces based on these two operations, which greatly reduces the development difficulty and improves the development efficiency.

Spark is a more mature distributed computing framework developed in the Hadoop technology system. It is a specific application implementation of the Map-Reduce model. Spark’s program, input, and output are stored in the computer’s memory so that the underlying distributed file system will no longer be read and written frequently in the process of data calculation, avoiding the IO consumption of disk reading and writing, to achieve a very high data processing efficiency [9]. The structure of the Spark core module is as shown in Figure 2.

Spark’s efficient computing performance makes it very suitable for applications in online real-time or quasi-real-time summary statistics, model calculations, and other scenarios.

2.3. Data Mining Algorithm. Data mining is to find hidden value information or laws from massive data and to provide support for human social management, business activities, scientific research, and production progress [10]. Searching and identifying effective information from a large amount of data is the main goal of data mining, and many tools and methods need to be applied in the process. These tools and methods include statistics, online analysis and processing,
information retrieval, machine learning, expert rules, and pattern recognition. On the whole, they are a model of using computing science to solve practical problems.

Association rules are the most common method in data mining algorithms. The goal of association rules is to find some internal relationship hidden among all objects. The basic methods of association rules mining can be described by the following methods:

Suppose that the database \( V = \{b_1, b_2, \ldots, b_n\} \) is composed of some transactions with unique identifiers, \( K = \{k_1, k_2, \ldots, k_m\} \) is a collection of a certain item, and each transaction \( b_i = \{i, 1, 2, \ldots, n\} \) corresponds to each subset \( K \). Suppose \( K_I \subseteq K \); the size of the support value of the item set \( K_I \) on the data set \( V \) Support refers to the size of the proportion of the item that contains \( K_I \) in \( V \) as follows:

\[
\text{Support}(K_I) = \frac{|b \in V | K_I \subseteq b|}{V}.
\]  

For the item set \( K \) and the database set \( V \), \( B \) is the nonempty subset of \( K \) that is not less than the minimum support; that is to say, all the item sets that meet the minimum support preset by people are called frequent item sets or large item set. These special item sets are the minimum support preset by people are called frequent item sets; that is to say, all the item sets that meet the minimum support preset by people are called frequent item sets or large item set. In the frequent item set, extract all minimum support preset by people are called frequent item sets.

The association rules similar to \( K_I \Rightarrow K_2 \) constructed on \( K \) and \( V \) can be mined after reaching a preset degree of trust or calling it a degree of confidence. The meaning of this confidence mainly refers to the ratio of the number of objects containing \( K_I \) and \( K_2 \) to the number of objects containing \( K_I \) as follows:

\[
\text{Confidence}(K_I \Rightarrow K_2) = \frac{\text{Support}(K_I \cup K_3)}{\text{Support}(K_I)}. \tag{2}
\]

The association rule that \( V \) satisfies the minimum support and the minimum trust in \( K \) is called a strong association rule.

### 2.4. Linear Discriminant Analysis

The basic idea of linear discriminant analysis (LDA) is to project high-dimensional data samples into the optimal discriminant vector space, which is used to separate two or more categories of objects or events and find the most appropriate projection space so that the data samples with multiple categories of features can project on this space with the least intersection to have the best separation effect [11].

1. **Symbolic representation of LDA**: Given a data matrix \( Q \in \mathbb{W}^{m \times n} \), each column of data is containing a type of feature. Suppose \( Q = \{q_1, q_2, \ldots, q_m\} = \{Q_1, Q_2, \ldots, Q_k\} \), where \( q_k \in \mathbb{W}^{m}(1 \leq k \leq n) \) represents a type of data feature, \( n \) represents the total number of sample, and \( k \) represents the total number of categories. At the same time, \( Q_i \in \mathbb{W}^{m \times n} \) represents a subset of all samples contained in a class \( i \), \( n_i \) is the number of data contained in the subset, and \( \sum_{i=1}^{n} n_i = n \) is inferred.

2. **LDA formal description**: Calculate the average value of the overall sample according to the above symbol description:

\[
z = \frac{1}{n} \sum_{i=1}^{k} Q_i. \tag{3}
\]

In the same way, the sample mean of class \( i \) can be obtained:

\[
z_i = \frac{1}{n_i} \sum_{q \in Q_i} q. \tag{4}
\]

According to the definitions of the overall hash matrix, interclass hash, and intraclass hash matrix, the following formula can be obtained:
\[ A_t = \frac{1}{n} \sum_{j=1}^{n} (q_j - z)(q_j - z)^T, \]
\[ A_b = \frac{1}{n} \sum_{i=1}^{k} n_i (z_i - z)(z_i - z)^T, \]
\[ A_u = \frac{1}{n} \sum_{i=1}^{k} \sum_{j \in Q_i} (q - z_i)(q - z_i)^T. \] (5)

In addition, based on the above hash matrix, the introduced Fisher standard function can be defined in the following two ways:

\[ S(u) = \frac{u^T A_{bb} u}{u^T A_{uu} u}, \]
\[ S(u) = \frac{u^T A_{u1} u}{u^T A_{uu} u}. \] (6)

In (6), \( u \) is expressed as an arbitrary \( n \)-dimensional column vector and the vector projection space that can maximize the result value of \( S(u) \) is selected through Fisher discriminant analysis. Analysis and research found that the eigenvector corresponding to the largest eigenvalue in the matrix \( A_{bb}^{-1} A_{bu} \) or \( A_{uu}^{-1} A_{ub} \) is the optimal projection space \( u \). Finally, according to the classification projection function \( y = u^T x - u^T z \), when \( y > 0 \) belongs to category 1; otherwise, it belongs to category 2. LDA is also a classification prediction algorithm. It mines the best projection space through the known classified sample data, which makes the data of different categories less coupled and the data of the same kind more aggregated. In this way, the unclassified sample data is predicted according to the projection space; that is, the unknown data category is marked by discovering the known data classification rules.

3. Rural Financial Mobile Services

3.1. Concept of Rural Financial Mobile Service. Rural financial mobile service is the financing of rural monetary funds under the specific environment and conditions of rural areas, which refers to the activities of raising, distributing, and managing rural monetary funds using credit [12]. Rural financial mobile service itself is an independent system, which is composed of rural financial mobile service supervisors, rural financial mobile service providers, and rural financial mobile service objects.


(1) A Large Number of Funds and Long Cycle. Agricultural production has changed from simplification to deep processing of agricultural products, from extensive economy to intensive economy, and agricultural products have also changed from a single grain and oil crop to a variety of cash crops. In this development process, agricultural production will produce more financing needs. In addition, agricultural industrialization has formed an industrial chain, which makes the capital demand expand from agricultural production to sales and logistics, and prolongs the capital demand cycle, which has an increasing demand for financial services.

(2) Financial Productive Diversification. With the improvement of farmers’ income level, farmers’ financial needs have changed from more meeting basic living needs to more meeting production needs. The development of the rural economy has led to the emergence of a large number of planting and breeding households and township enterprises. They need a lot of production and development funds, and the required infrastructure, technological transformation, and daily operation need financial support. Moreover, with the accelerating pace of rural urbanization, the rural industrial structure will be replaced, the proportion of the primary industry will decline, and the proportion of the secondary industry and the tertiary industry will continue to rise.

(3) Diversification of Rural Loan Market. The rural loan market has gradually shown a diversified development trend in its development, liberalized the loan interest rate of commercial banks, and expanded the floating range of loan interest rate of rural credit cooperatives. It emphasized increasing support for agriculture, rural areas, and farmers and adopted a series of monetary policies. It is difficult for farmers and township enterprises to obtain loans, and it is difficult for financial institutions to obtain loans. A large number of credit funds have been lost or even lost.

4. Demand Analysis of Rural Financial Mobile Service Management System


(1) System Management Module. The system management part is the unified management of the system’s business function nodes, operating users, operator operating rights, and some business parameters. The term “system parameter setting” refers to the process of defining the system’s operational parameters, which includes analysis model setting, evaluation model setting, data structure set, and process set. The system parameters specifically include customer information parameters, evaluation model parameters, and credit line parameters.

(2) Customer Information Management. Customers are mainly divided into legal person customers and natural person customers, and legal person customers are subdivided into general customers, dealers, institutional customers, affiliated companies,
credit customers, and so on. The customer information module is mainly composed of a customer information management module and customer information import management module, which is used to complete the entry, update, deletion, import, cleaning, and extraction of customer information.

(3) **Customer Credit Evaluation.** Customer credit scoring is a method and technology for financial institutions to use the information about credit applicants to predict risks. It is a method that applies mathematical and statistical models to personal credit-granting decision-making, comprehensively evaluates the ability and credibility of individuals to fulfill various commitments, and determines credit rating and credit limit. The customer credit evaluation module evaluates the customer’s credit through the established credit evaluation model and obtains the score and grade of its credit evaluation. The module is divided into two parts: establishing the customer credit evaluation model and evaluating the customer’s credit [13].

(4) **Calculation of Customer Credit Line.** It includes calculation of maximum credit line, determination of risk coefficient, and calculation of credit line. The credit balance of the customer is obtained through the calculated maximum credit line and the used credit line.

(5) **Loan Application Review Process.** It realizes the online application approval process, which includes the preliminary review, and approval processes from application submission to loan processing.

(6) **Loan Review Decision Support.** The loan review decision is made according to the task. The applications that have passed the decision enter the application review process management for review, approval, lending, and settlement and extract the loan review report according to the parameters for the reference of the reviewers. The loan review committee will adjust the credit content in terms of credit elements and risk control measures through the loan review process and then vote. The voting results and loan review opinions will be fed back to the applicant and relevant roles. The contract content of the customer’s application through the loan review meeting shall be automatically verified by the content of the loan review decision.

(7) **Data Statistical Analysis.** Statistical analysis is performed on customer quantity, loan amount, and other data by region, time, financial product, and other dimensions, and statistical graphics are generated dynamically. The data statistical analysis in the system mainly includes regional brand loan statistics, loan scale benefit quality statistics, loan balance by brand statistics, fund recovery, customer risk analysis, corporate business risk analysis, and regional performance statistics.

4.2. **Feasibility Analysis of System Development.**

(1) **Economic Feasibility Analysis.** Based on the original intranet construction, the rural financial mobile service management system uses the original network and hardware resources to ensure that the system is designed under the concept of saving cost and resources. Based on the full investigation and analysis of software and hardware, it is affirmed that the development of rural financial mobile service management systems will promote the development of rural financial mobile service business and benefit the growth of rural financial mobile service benefits.

(2) **Technical Feasibility Analysis.** Study and establish a flexible, fair, scientific, and widely covered rural financial mobile service management system, adopt SQL 2000 dynamic database technology, establish a strong and stable database back-end support platform, and adopt B/S system structure [14], using ASRNET and REPORTINGSERvCIES report management technology and other front-end display technology to achieve the core of quantitative assessment performance and develop a set of scientific specifications. C# is used in the programming language, which can greatly improve the efficiency of code execution. The rural financial mobile service management system and other internal subsystems of the rural financial mobile service management use XML technology to achieve system integration. This technology is widely used in the development of web programs. In summary, the technical framework for the development of the rural financial mobile service management system is very reasonable, which can not only realize the functions of the system, but also reduce the user’s cost input, so it is technically feasible.

(3) **Security Feasibility Analysis.** The rural financial mobile service management system has a large amount of data, and security is very important. First of all, the system is equipped with strict identity verification, and different access rights are set for different system users. Secondly, in the network security settings, firewall technology is used to ensure a secure connection between the intranet and the Internet. Finally, in terms of system integration, XML technology has a strong security mechanism, which can not only ensure information sharing but also ensure the security of the system.

(4) **Implementation Feasibility Analysis.** This rural financial mobile service management system is an upgrade and transformation of the original rural financial mobile service management system, combined with the advantages of the original system, and the original system data is migrated. At the same time, according to the idea of rural financial mobile service management construction, the system is designed by the rural financial mobile service management process. Finally, coupled with the
support of the rural financial mobile service management leadership, it effectively guarantees the development of the rural financial mobile service management system. After feasibility analysis, system developers believe that system development can be carried out by user needs under current conditions.

5. Rural Financial Mobile Service Management System Design

5.1. System Architecture Design. Based on Hadoop’s big data technology, a big data analysis service management system architecture suitable for the field of rural finance is designed. Based on Map Reduce and Spark [15], it integrates the service management requirements of big data analysis, analysis of service management combination, planning of big data management tasks, real-time decision analysis, big data analysis, processing algorithms, data resource collection, and storage. The specific overall system architecture is as shown in Figure 3.

As can be seen from Figure 3, the overall architecture of the system includes the following six parts:

(1) Service management requirement description: Users can administer each aspect of the system directly using the service management interface, create and conduct decision tasks, and submit their requests. Furthermore, the service requirements limit user login and function access permissions, allowing the system to distinguish between regular users, expert users, and managers, and open the functions that correspond to distinct service requirements for them.

(2) Service management plan generation: It mainly provides users with atomic service management and analysis service management portfolio. The analysis service management portfolio is obtained through multiperspective learning, which can be combined according to the relevance of data in atomic service management and evaluate the effectiveness of the portfolio. Finally, it is proved that the analysis result of the portfolio is more accurate. In this way, the appropriate analysis service management composition template is matched according to different user needs to achieve high-value data analysis results.

(3) Big data management task plan: A good task plan can solve the problem of complex big data analysis service demand. Through the idea of divide-and-conquer, a single task is divided into multiple easy-to-execute subtasks to meet the supply of computing and storage resources. The task layer will formulate the task process according to the data flow management process, which can be represented by a directed acyclic graph. It can finely manage the execution process of the program, reasonably schedule online and offline computing tasks, and allocate appropriate computing resources.

(4) Real-time decision analysis: It is mainly composed of decision combination and decision calculation. Decision combination mainly obtains the template through the mining and analysis of historical data and then obtains good combination decisions through in-depth learning. Decision computing combines task planning into multiple computing tasks, which are executed on the distributed computing platform. It can obtain the analysis results in time and assist users in decision making.

(5) Data resource acquisition and storage: Data acquisition includes two parts: historical data and real-time data fusion. Historical data collection is mainly composed of distributed file systems and distributed memory sharing systems. Real-time data fusion consists of real-time data, data pipeline, and memory buffer pool. The data pipeline can not only synchronously fuse multisource data, but also process and clean.

5.2. Software Structure Design. This paper examines the technical content of the current service management system using the overall architecture of the above system, as well as linear discriminant analysis and data mining algorithms, and concludes that the implementation of rural financial mobile service management must address several issues, including user management, service management, demand management, decision management, task planning management, and task scheduling management. The specific system software architecture is as shown in Figure 4.

As can be seen from Figure 4, the key technologies are mainly divided into three aspects: interaction layer, decision layer, and execution layer. The interaction layer mainly completes the creation and maintenance of accounts, service requirements, classification, and control of access rights. The decision-making layer is responsible for providing services to assist users in making decisions. For the optimization requirements of service value and timeliness, it needs the support of machine learning, analysis algorithm, and other technologies. The execution layer needs to calculate the task capacity and resource capacity according to the service computing task plan formulated by task scheduling to reasonably allocate tasks. At the same time, according to the size of data storage, some data used by the interaction layer and decision-making layer are stored in the file system HDFS, and then the data processing according to the decision-making layer and execution layer are stored in the memory database Redis, which can adapt to the characteristics of fewer data and high real-time requirements.

5.3. System Function Design. The rural financial mobile service management system mainly deals with rural consumer credit business, including system management module, customer information management, customer credit evaluation, loan application, approval process, loan approval decision-making, loan repayment business,
statistical analysis, and other functional modules. The functional structure of the system is as shown in Figure 5.

(1) **System Management Module.** It includes security authentication management, business function node management, user management, authority management, and business parameter setting. It is mainly responsible for the configuration and unified management of system parameters.

(2) **Customer Information Management Module.** In addition to the maintenance and query functions of customer information, it also includes the extraction and import of external customer information.

(3) **Customer Credit Evaluation Module.** Score the credit of loan customers according to different evaluation models.

(4) **Loan Application Review Process Module.** Process credit processes such as preliminary review and approval of applications.

(5) **Loan Approval Decision Voting System Module.** Realize the functions of the person in charge of the enterprise center, such as credit evaluation of key customers, especially corporate customers, setting decision opinions, and whether the voting application is passed.

(6) **Loan and Repayment Business Module.** Loan and repayment business for customers who are allowed to make loans.

(7) **Statistical Analysis Module.** Comprehensively analyze the loan income of current enterprises in many aspects.

5.4. **System Database Design.** The database modeling in the system design process is realized by the power designer. Due to the complex data relationships in the system, here are only a few representative database modeling, such as maintenance plan parameter settings in system management, customer-related information, and loan review decision support voting system.

5.4.1. **Maintenance Plan Parameter Setting.** Because the system requires different operators to have different operation requirements for data items, even if each operator operates the same data table, the data items that can be maintained may be different. Therefore, the objects operated by users cannot be based on data tables, but on maintenance
schemes. Each maintenance scheme is for different or the same data tables. Even for the same data table, the data items maintained are different. This part of the system provides five data tables:

1. **Data Dictionary Table.** It is used to store some basic information of data items (fields), such as field name, data table, field length, and field data type, whether it is a primary key.

2. **Scheme Table.** It is used to store information related to maintenance schemes, such as scheme name, description, and number of data tables corresponding to the scheme.

3. **Define Scheme Tab Table.** The number of data tables operated by the maintenance scheme, which is specifically reflected in the number of pages using the Tab page control.

4. **Scheme Requirements Table.** When specific to each scheme, it is associated with the data dictionary table to describe the relevant field information of the scheme. In addition, it mainly describes the particularity of the data items in the scheme, such as display form text box, drop-down options, and so on, field verification method, and so on.

5. **User Scheme Authorization Table.** Different users use different maintenance schemes. This table mainly includes the login number, function node number, and corresponding maintenance scheme number of the login user.

5.4.2. Customer-Related Information. The customer-related information tables in the system are mainly divided into three categories: a natural person-related information table, a legal person-related information table, and an application information table.

1. In addition to the basic information of natural persons, the data tables related to natural persons...
also include the employment experience table, residence information table, relatives and friends information table, investment balance sheet, and credit report.

(2) In addition to the basic information of legal persons, there are also information tables of senior executives in the data tables related to legal persons.

(3) The natural and legal person information data sheets are closely related to the application information form. The "client type" field in the application information form is used to distinguish whether the applicant is a legal person or a natural person. The "customer number" field stores the natural person's number or legal person's number. In addition to the basic application information, the relevant information in the application form also includes basic information about financial mobile services and contract guarantee information.

5.4.3. Decision Support Voting System for Loan Review. The loan review committee member setting table in the loan review decision support voting system is mainly used to set the members of the loan review committee and their rights. The risk control measures table stores some existing risk control information and can update or add new control measures at any time as needed. The veto item parameter table stores some existing veto reasons, which are the most commonly used, and can dynamically delete and modify reason items according to specific conditions. Several other associated data tables are used to determine the loan review meeting, individual participation, and fill-in decision-making opinions.

6. System Test Results and Analysis

In this section, we will discuss setting system test environment, system functional test results, system resource utilization test results, and system response time test results in detail.

6.1. Setting System Test Environment. To test the effectiveness of the designed rural financial mobile service management system based on big data, the development environment in this article is deployed on 10 computers. Among them are one that plays the role of NameNode and one that plays the role of JobTracker, and the other machines are DataNode and TaskTracker. The machine's operating system is Ubuntu, and the version used by Hadoop is 0.2. The nodes communicate with each other through the SSH protocol, and two Map and Reduce task slots are configured, respectively.

To reduce the consumption of manpower, material resources, and time in the later stage, software testing is essential. At present, the commonly used software testing methods mainly include white-box testing, black-box testing, and gray-box testing. The main difference between the black-box test and the white-box test is that the white-box test does not need to see the internal control structure to test whether the system can run according to the originally envisaged requirements. The black-box test is mainly to input external data, calculate, transfer, and store the internal data of the system, to verify whether the system can operate normally. This paper mainly adopts the black-box test method.

6.2. System Functional Test Results. The test of the rural financial mobile service management system is based on the black-box “exhaustive input.” In other words, not only the normally compliant data should be entered into the system to test whether the system can operate normally, but also the noncompliant data should be entered to ensure the logical correctness of the system and the comprehensiveness of application data. The main functional modules are the system management module, customer information management module, customer credit evaluation module, loan application and approval process module, loan approval decision voting system module, loan repayment business module, and statistical analysis module. The functional test results of the system designed by different methods are obtained by comparing the methods of [4], the methods of [5], and the proposed method, as shown in Table 1.

According to Table 1, the function of the loan application process module designed by the method of [4] failed to pass the test, and the function of the loan repayment business module designed by the method of [5] failed to pass the test. The main functional modules of the system designed by the proposed method can be realized, can be implemented according to the relevant requirements, and all have passed the system test. It can be seen that the system designed by the proposed method has good functionality.

6.3. System Resource Utilization Test Results. To test the resource utilization of the system designed by the proposed method, the method of [4], the method of [5], and the proposed method are compared, respectively, and the resource utilization test results of the system designed by different methods are obtained, as shown in Figure 6.

According to the analysis of Figure 6, when the number of clients is 500, the average resource utilization rate of the system designed by the method of [4] is 85.2%, the average resource utilization rate of the system designed by the method of [5] is 78.5%, and the average resource utilization rate of the system designed by the proposed method is as high as 95.3%. Therefore, compared with the method in [4] and the method of [5], the proposed method has a higher resource utilization rate.

6.4. System Response Time Test Results. Further, test the response time of the system designed by the proposed method; compare the method of [4], the method in [5], and the proposed method, respectively, and get the response time test results of the system designed by different methods, as shown in Figure 7.

By analyzing Figure 7, we can see that with the increase of the number of clients, the response time of systems...
designed by different methods increases. When the number of clients is 500, the response time of the system designed by the method of [4] is 28.2s; the response time of the system designed by the method of [5] is 22.5s, while the response time of the system designed by the proposed method is only 10.3s. It can be seen that the response time of the system designed by the proposed method is shorter than the method of [4] and the method of [5].

7. Conclusion and Future Work

The big data-based rural financial mobile service management system proposed in this study fully utilizes the benefits of big data technology. Its rural financial mobile service management system has good functionality, high resource utilization, and short response time. However, in the rural financial mobile service management system, due to the limitations of technical level, the data information is not perfect. Therefore, in the next research, the customer information is extracted into a data warehouse, and the prediction results are applied to the system in the form of statements to assist in the analysis of loan approval results more accurately.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The author declares that he has no conflicts of interest regarding the publication of this paper.

References


