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*Research Article*

# Construction of Cloud Library Intelligent Service Platform Relying on Artificial Neural Network

**Lei Sun**,[1] **Yingxia Li**,[2] **and Yuli Lu**[1]

[1]*The Library of the First Affiliated Hospital of Hebei North University, Zhangjiakou 075000, Hebei, China*
[2]*The Library of Hebei University of Architecture, Zhangjiakou 075000, Hebei, China*

Correspondence should be addressed to Lei Sun; sunlei@hebeinu.edu.cn

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With the advanced development of data center and network information technology, digital library has become a user sharing platform with a variety of digital information sources, providing users with flexible and diverse personalized services. However, the existing digital library lacks data analysis information and only publishes book information and related borrowing frequency and other information. As an ideal architecture model for library applications, cloud library can integrate distributed digital information sources, optimize digital libraries, and provide users with flexible, diverse, and personalized services. Therefore, based on the related research on cloud library and neural network algorithm, this paper not only focuses on the artificial network algorithm, but also focuses on the concept, features, and method of building the digital library platform based on the artificial network algorithm. Under the support of related theories and technologies of cloud library service platform, it also builds a cloud library intelligent service platform model based on artificial neural network. The research results showed that the time spent by BPNN in processing borrowed books was generally about 6 minutes, while the time required by RNN was 10 minutes. However, the processing of BPNN is not stable. Therefore, when building an intelligent service platform, different algorithms need to be selected according to individual needs.

## 1. Introduction

As an integral part of technology and application, cloud computing provides a comprehensive guide for the future development of the library. As a data center, the library can make full use of the available server resources, conduct information services without time constraints, and use powerful wireless Internet services to determine maximum access to library information sources. However, there are many problems in the current cloud library, so we introduce neural network to improve and optimize the cloud library to build a cloud library smart service platform. The mission of smart library technology is to improve the status quo of libraries so that they can adapt to rapidly developing technological systems. The smart library is one of the most important components in the public education system of the smart city, so the intelligent service platform of the cloud library becomes more and more important. Especially after entering the information age, the role of the library is particularly prominent: as a sharing center of information resources, it can effectively reflect the quality of the overall education level and promote the development of social education.

For the construction of the intelligent service platform, many domestic and foreign experts have made efforts. Bajpai and Kidwai provided NPTEL video courses for online platforms. The virtual lab enabled students to conduct experiments online without setting up any specialized labs via internet enabled devices. It provided a platform for students to design problem codes and analyze them by changing relevant parameters [1]. Wei et al. explore the use of big data technologies such as genetic algorithms to mine massive tourism data and establish a comprehensive tourism information service platform for the government, enterprises, tourists and scientific research institutions. The overall design of the industrial information service platform based

on tourism big data is proposed [2]. Cui et al. have created an exclusive altar of home maintenance services based on machine training and wireless sensor networks. Based on the design requirements, the wearable self-assembly system is optimized and optimized, focusing on the design and implementation of software and the application of the application management control unit in the construction of the new system architecture [3]. In order to construct the relationship between books and publications, Zhang constructed a mathematical retrieval model. Based on this model, a retrieval and recommendation algorithm for mobile cloud computing platform was proposed. The experimental results showed the intelligence and accuracy of the algorithm [4]. Chen and Wang proposed an interoperable, intelligent, and integrated platform called I3City to build a sustainable smart ecosystem. We provide general expert knowledge and services and support for many top-notch smart city applications to further create a comprehensive cloud-based workflow for smart city development and service [5].

However, due to the method and time, these service platforms lead to low service efficiency and cannot meet people's service needs. Therefore, a study of the literature on artificial neural networks was conducted. Li et al. implemented a dynamic programming algorithm through a neural network and trained it through time backpropagation, proving that the proposed neural vector control strategy is effective, showing that the neural network improves the performance and stability under perturbation [6]. Safa et al. predict wheat harvesting under different conditions and farming systems under direct and indirect technical factors through a well-developed neural network model. The error rate of the final projection is ±9%, which indicates that the neural network algorithm has a good prognosis [7]. Tarawneh has developed an artificial intelligence network (ANN) model for predicting N60 values from CPT data. Model inputs include CPT resistance tip, effective vertical resistance, and CPT manual combat. The results show that ANN has a good correlation [8]. Cascardi et al. proposed a detailed model based on a strong synthetic concrete network to predict the strength of FRP compressed concrete. The results show that the model is more accurate than other algorithms [9].

The article outlines the smart library, introduces the basic principles, characteristics, key elements, and goals of the smart library, analyzes and summarizes the service mode of the smart library, and describes the support system of the cloud library smart service platform. The intelligent service platform model of cloud library under different neural network algorithms is also constructed, and the effects of different algorithms are compared, which provides theoretical reference for the intelligent service of Zhiyun library in the future.

## 2. Methods

*2.1. Smart Library.* Over the past half century, with the progress of society and the importance of institutions and the advent of advanced technology, the face of the library has undergone tremendous changes [10]. With the development of computer simulation technology, digital multimedia technology, and Internet technology, the library has also experienced the transformation from traditional library to automated library and digital library. As a place for the future development of the library, the smart library has attracted people's attention in its working form and method. At present, the intelligent service of cloud library is mainly realized by digital library. The digital library is a new concept developed after the 1990s [11]. With the rapid development of computer technology, especially the advanced development of network technology, intelligent technology, and data transmission technology, users' demand for library services is increasing. There are new requirements for the collection, organization, retrieval, utilization, etc. of retrieval and use of information sources. Therefore, as users' demands for information resources continue to increase, digital libraries with more comprehensive services emerge as the times require. Search and precise location is a common module for readers and librarians, mainly to provide the precise location of books. The intelligent inventory module is mainly to solve the problem of heavy workload when the librarians carry out inventory. Its main functions are random shelf query, book classification, shelf location collection, and book statistics. When conducting regular inventory, the intelligent information service system can grasp the borrowing situation of books at a glance.

The traditional university library information service business is a passive, simple, closed, multi-individual, scattered, and shallow-level document-based service mode through manual operation by manual librarians. In the previous service mode, the library's work was centered on documents, and the access provided to readers was mainly based on primary and secondary documents. This service mode can no longer meet the requirements of the development of the times for universities to cultivate talents.

The traditional digital library architecture is shown in Figure 1. Users can access the library's portal through terminals or browsers to perform tasks such as retrieval, borrowing, and consultation [12]. The server function of the service layer configures and quantifies the user query information, and sends the user query to the server application layer. The functions of the system are published statistically, and each library needs to install relevant systems to perform the functions of the digital library. The digital library based on cloud computing technology has a powerful application server, which has the ability of control, easy use, and personalization [13, 14].

The compound library is the manifestation of most university libraries. It comprehensively applies traditional technology, digital technology, and network technology and integrates the organization and management of paper version, electronic version, and information resources in the network. At present, university libraries mostly use barcode technology for book management. Books are affixed with barcodes. Librarians need to use scanning guns to obtain barcode information and transmit it to the computer system for further processing.

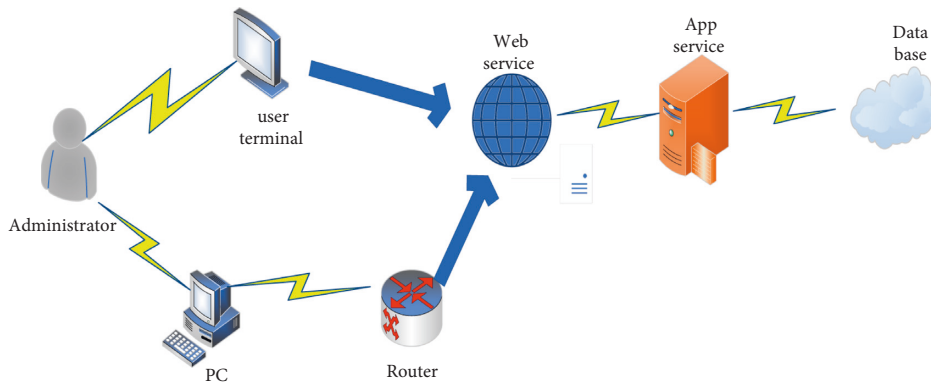


Figure 1: Traditional digital library architecture.

Under the influence of digitization and networking, most libraries will take the form of public libraries, except for a few libraries that can be converted into digital libraries through digital sources [15]. To successfully build a smart library, we need to see a revolutionary change in the services provided by the smart library to users. Therefore, we must explore and explore new science and technology to overcome difficulties. In order to build a more complete intelligent library service platform, we introduce artificial neural network algorithms to achieve better results. The smart library architecture is shown in Figure 2.

The information service system of smart library in colleges and universities will provide comprehensive and high-value information resources and the function of dynamic tracking at any time. The main functions of self-service borrowing and returning books are self-service borrowing, returning, renewing, and booking services. Borrowing and returning books is free from the limitation of the opening and closing time of the library. The renewal is also done by self-service. Reservation is for searching books, which is mainly for books that readers want to borrow but are not in the library. If the books are returned, the system will prompt the readers, which is convenient for readers and reduces the workload of librarians.

At present, the intelligent library also has the following problems:

(1) Technical problems of information resource storage

Storing information sources is a major obstacle to the development of digital libraries. Multilingual retrieval, cross-platform data retrieval, human-computer interaction technology, data sharing of various standard databases, tools and software required for digital libraries, etc. all require further technological development. With the massive increase of digital library information resources, database capacity, management, and backup capacity are limited, which is also a major challenge faced by digital libraries.

(2) Information requirements and resource sharing issues

The digital library eliminates the initial time and space constraints of library services and enables traditional library services to provide better information services. However, in order to ensure the security of the data source on the server and the reliability of the server, the library has a limit on the maximum number of server responses and the number of access points, forming a dilemma that end users are limited in accessing the server. At the same time as the access to the server is restricted, the sharing of information resources is also restricted.

According to the user's demand for the system, it analyzes the business demand, functional demand, and performance demand. The business demand mainly explains the change of the library's information service mode. The functional requirements are designed to realize one-stop management for the efficient smart library information service system. For this system, four modules need to be constructed to realize the smart service mode of unified management. Performance analysis is the choice of the environment in which the system will be used.

The functions of the intelligent inventory function module include book statistics, book classification, random shelf query, and shelf location collection. The implementation of the shelf label on the reader then realizes the inventory function. The intelligent inventory is to transmit the frequency band corresponding to the bookshelf through the reader, and the RFID electronic tags of the books located in the bookshelf feed back the information to the reader, and the existing books of the bookshelf are displayed through the reader interface. The "marked red" prompt identifies the interface of the reader.

*2.2. Artificial Neural Network.* Artificial neural network is essentially a mathematical model, and the system is composed of many interconnected neurons. Each neuron can mimic some way of processing information. The connection between each two neurons represents the weight of the signal passing through that link. The artificial neural network model is shown in Figure 3.

Artificial neural network is a nonlinear, self-adaptive information processing system composed of a large number of interconnected processing units. Artificial neural networks have some basic characteristics: nonlinearity. Nonlinear relationships are a universal property of nature. The intelligence of the brain is a nonlinear phenomenon. Artificial neurons are in two different states of activation or

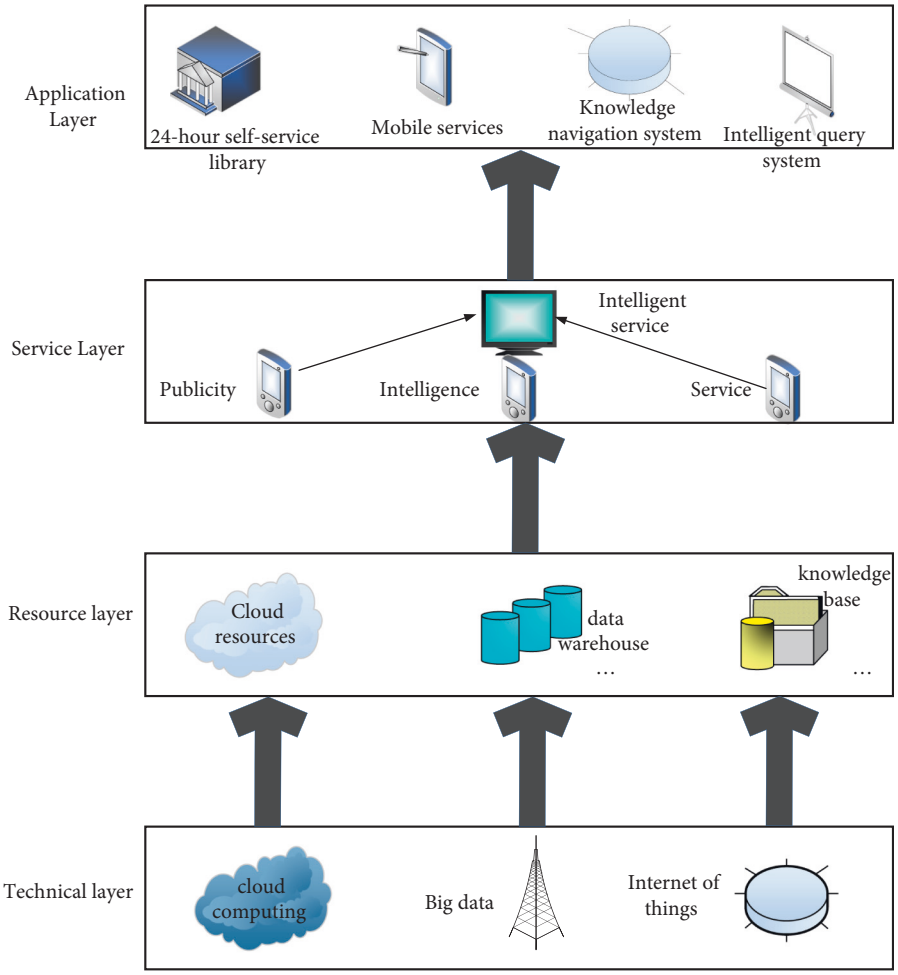


Figure 2: Smart library architecture.

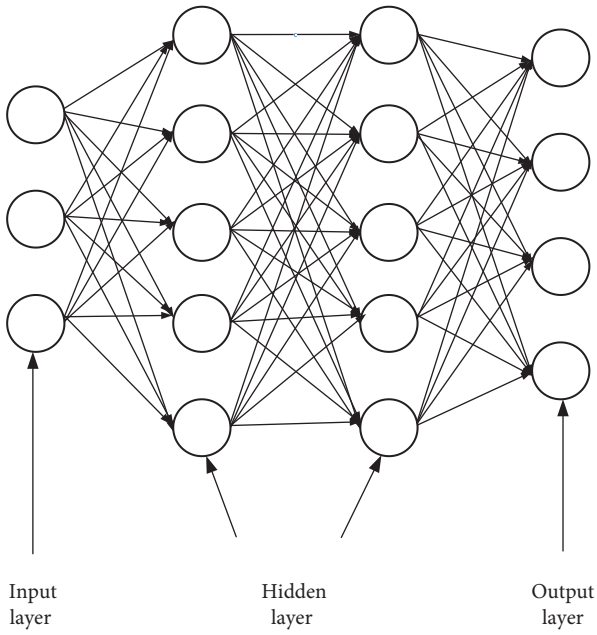


Figure 3: Artificial neural network.

inhibition, and this behavior is mathematically expressed as a nonlinear relationship. A network of neurons with thresholds has better performance and can improve fault tolerance and storage capacity, nonlimiting. A neural network is usually composed of multiple neurons that are widely connected. The overall behavior of a system is not only determined by the characteristics of individual neurons, but may be mainly determined by the interactions and interconnections between units. Simulate the nonlimitation of the brain through the large number of connections between units. Associative memory is a classic example of nonlimitation.

The artificial neural network does not need to determine the mathematical equation of the mapping relationship between the input and output in advance. It only learns certain rules through its own training and obtains the result closest to the expected output value when the input value is given. As an intelligent information processing system, the core of the artificial neural network to realize its function is algorithm.

According to the research results of biologists, the human brain usually has more than ten billion nerve cells. Each nerve cell consists of a cell body, an axon that can connect with other nerve cells, and a large number of dendrites. The

most commonly used artificial neural network algorithms are as follows.

*2.2.1. BP Neural Network.* The implementation of the BP algorithm needs to be based on a feedforward multilayer network. The feedforward multilayer network structure is that the process of the signal of the artificial neural network from the input to the output is forwarded. A neuron is usually able to receive multiple input signals, and $P1, P2, \ldots, Pn$ can be used to represent the $n$ input signals received by the neuron.

The basic BP algorithm includes two processes of signal forward propagation and error backward propagation. That is, the calculation of the error output is performed in the direction from input to output, while the adjustment of weights and thresholds is performed in the direction from output to input. During forward propagation, the input signal acts on the output node through the hidden layer, and after nonlinear transformation, the output signal is generated. Error backpropagation is to backpropagate the output error layer by layer to the input layer through the hidden layer, and distribute the error to all units in each layer, and use the error signal obtained from each layer as the basis for adjusting the weights of each unit.

The calculation process of the BP neural network consists of forward calculation process and reverse calculation process. In the forward propagation process, the input mode is processed layer by layer from the input layer through the hidden unit layer, and then turned to the output layer. The state of neurons in each layer only affects the state of neurons in the next layer. If the expected output cannot be obtained in the output layer, turn to backpropagation, return the error signal along the original connection path, and modify the weight of each neuron to minimize the error signal:

$$P = [P1, P2, \ldots, Pn]. \tag{1}$$

Hard limit function, whose expression is as follows:

$$\begin{aligned} y &= f(x) \\ &= \begin{cases} 0 & x < 0, \\ 1 & x \geq 0, \end{cases} \end{aligned} \tag{2}$$

or

$$\begin{aligned} y &= f(x) \\ &= \operatorname{sgn}(x) \\ &= \begin{cases} -1, & x < 0, \\ 1, & x \geq 0. \end{cases} \end{aligned} \tag{3}$$

Among them, $\operatorname{sgn}(\cdot)$ is called the symbolic function, and the sigmoid function has been widely used in neural networks before, and its expression is as follows:

$$\begin{aligned} y &= f(x) \\ &= \frac{1}{1 + e^{-\lambda x}}. \end{aligned} \tag{4}$$

Gaussian radial basis function, its expression is as follows:

$$\begin{aligned} y &= f(x) \\ &= \exp\left(-\frac{x^2}{\delta^2}\right). \end{aligned} \tag{5}$$

We present the careless loss function whose expression is as follows:

$$L_\phi(y, f(x)) = (|y - f(x)| - \phi), |y - f(x)| - \phi < 0. \tag{6}$$

Using the soft boundary method, a relaxation factor is introduced; the optimization problem is obtained:

$$\begin{aligned} &\min \frac{1}{2}\|w\|^2 + C\sum_{i=1}^{l}(\lambda_i + \gamma_i), \\ &\text{s.t.} \begin{cases} yi - \left(w^T x_i + b\right) < \tau + \lambda_i, \\ \left(w^T x_i + b\right) - y_i < \tau + \gamma_i, \\ \lambda_i,\ \gamma_i \geq 0. \end{cases} \end{aligned} \tag{7}$$

Finally, it gets

$$\begin{aligned} f(x) &= \sum_{i=1}^{l}\left(a_i - a_i^*\right)(x_i, x) + b, \\ b &= y_i - (w, x) - \varepsilon,\ a_i \in (0, C), \\ b &= y_i - \left(w, x_i\right) + \varepsilon,\ a_i^* \in (0, C). \end{aligned} \tag{8}$$

From the above process, it can be concluded that the training of the BP neural network is to continuously calculate from the input layer to the output layer through the data and obtain the final output; next it compares the result with the expected value to get the error value; then the error value is corrected in the direction of decreasing.

*2.2.2. Recurrent Neural Network.* Recurrent neural network is referred to as RNN for short. By adding time-related connection layers, the artificial neural network has the ability to model the time dimension. This also means that in addition to the usual input layer of RNN can input data, the order of data input will also affect machine learning. RNN neurons are shown in Figure 4.

In the recurrent neural network, it has the structure of storing and remembering the previous information, and after weighted processing according to the previous information, it is associated with the information received later. The schematic diagram of RNN neuron information transmission is shown in Figure 5.

In general, measurements are corrected with an improvement algorithm in neural network training. The redesign algorithm must test the development and the results are as follows:

$$f'(x) = f(x)(1 - f(x)). \tag{9}$$

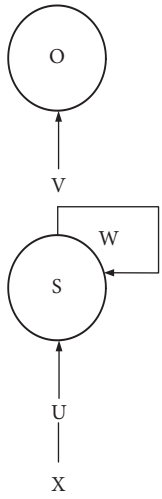


Figure 4: Schematic diagram of RNN neurons.

It creates backups of the training model with framework-level definitions for training data. The frame of each action is defined in the vertical plane, i.e., the state definition. The nodes of the path are

$$\delta_1(i) = \pi_i b_i(o_1), \ (1 \le i \le N). \tag{10}$$

Each additional time corresponds to a new level in the algorithm. Then, the type of correction for the time point is as follows:

$$\psi_t(j) = \arg\max\left[\delta_{t-1}(i)a_{ij}\right]. \tag{11}$$

The data $X_i$ to be classified are divided into $c$ fuzzy division groups, and the cluster center under each fuzzy division is obtained. A random number in the range of [0, 1] initializes a membership matrix U of $i * j$, and any element $u_{ij}$ in the matrix satisfies the conditions:

$$\sum_{i=1}^{c} u_{ij} = 1, \ \forall i = 1, 2, ..., n. \tag{12}$$

$u_{ij}$ means $X_i$ for the degree of membership of cluster center $v_i$, and calculate each cluster center $v_j$:

$$v_j = \frac{\sum_i^n = 1 u_{ij}^m x_i}{\sum_i^n = 1 u_{ij}^m}. \tag{13}$$

The charge function is

$$\begin{aligned} J(U, v_1, \ldots, v) &= \sum_{i=1}^{c} J_i \\ &= \sum_{i=1}^{n} u_{ij}^m d^2\left(x_i, v_j\right). \end{aligned} \tag{14}$$

Update the membership matrix $U$, and then return to the step

$$u_{it} = \sum_{j=1}^{c} \left(\frac{d_{it}}{d_{it}}\right)^{-2/(m-1)}. \tag{15}$$

The formula for the visible layer unit is

$$P(v_i = 1|h, \theta) = \sigma\left(a_i + \sum_j W_{ij} h_j\right). \tag{16}$$

In this study, we mainly compare the effects of BPNN and RNN in building an intelligent service platform for cloud libraries, so other artificial neural network algorithms are not explained.

*2.3. Knowledge Service Model.* The basis for the operation of a system or model is to have a system to support it. The support system of the knowledge service model of the smart library can basically be divided into four parts: technology, resources, organization, and application. The organizational layer focuses on the development of users and librarians and improves the minds of users and librarians through regular training. Through real-time communication and cooperative learning, librarians and users are expected to reach a common mind, which provides a good foundation for the development of smart library knowledge services.

The resource layer preserves and manages the rich collection resources well through the clustering of the library and its resources, the deep mining of knowledge, and the construction of a good resource guarantee system for the use of users. The technical layer uses the Internet of Things, cloud computing, RFID, and other high-tech to provide technical support for smart services. The application layer provides users with convenient, efficient, and humanized intelligent services by establishing portal websites, search engines, and mobile knowledge service platforms. Figure 6 shows the support system diagram of the knowledge service model of the smart library.

The intelligent service model of this paper is based on the premise of the intelligent library, which re-extracts, processes, and manages the information and knowledge of all libraries and networks. Using artificial neural network and database technology, according to the discipline or a certain system structure, the massive and complex information will be re-analyzed and summarized, and a brand-new specialized and intelligent navigation library will be established. On this basis, deeply understand the reorganized knowledge information, explore the potential relationship between knowledge and knowledge, and create unique new knowledge products for users to use through the wisdom of librarians.

The development goal of the smart library is to realize the sharing of information resources and the integrated acquisition of information services and finally realize the integration of cross-platform, cross-space-time service integration. It actively provides users with intelligent services of information resources, so that when using the library, they can obtain one-stop book resources and information services at anytime and anywhere. This paper focuses on the wisdom of smart library services.

The smart library service model can deeply mine information resources, conduct in-depth analysis of user needs, and provide more accurate, diverse, and valuable

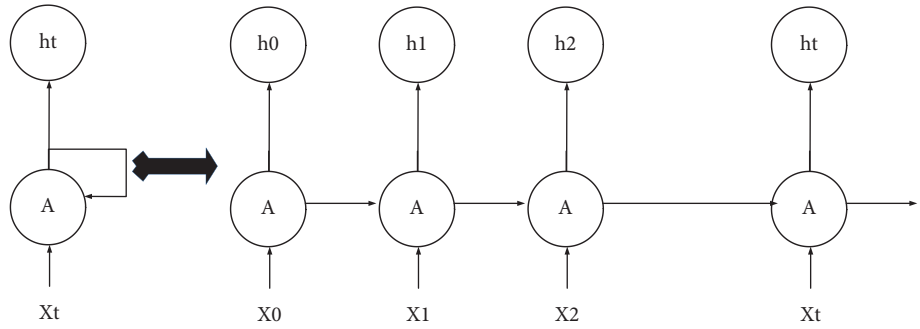


Figure 5: Schematic diagram of RNN neuron information transmission.

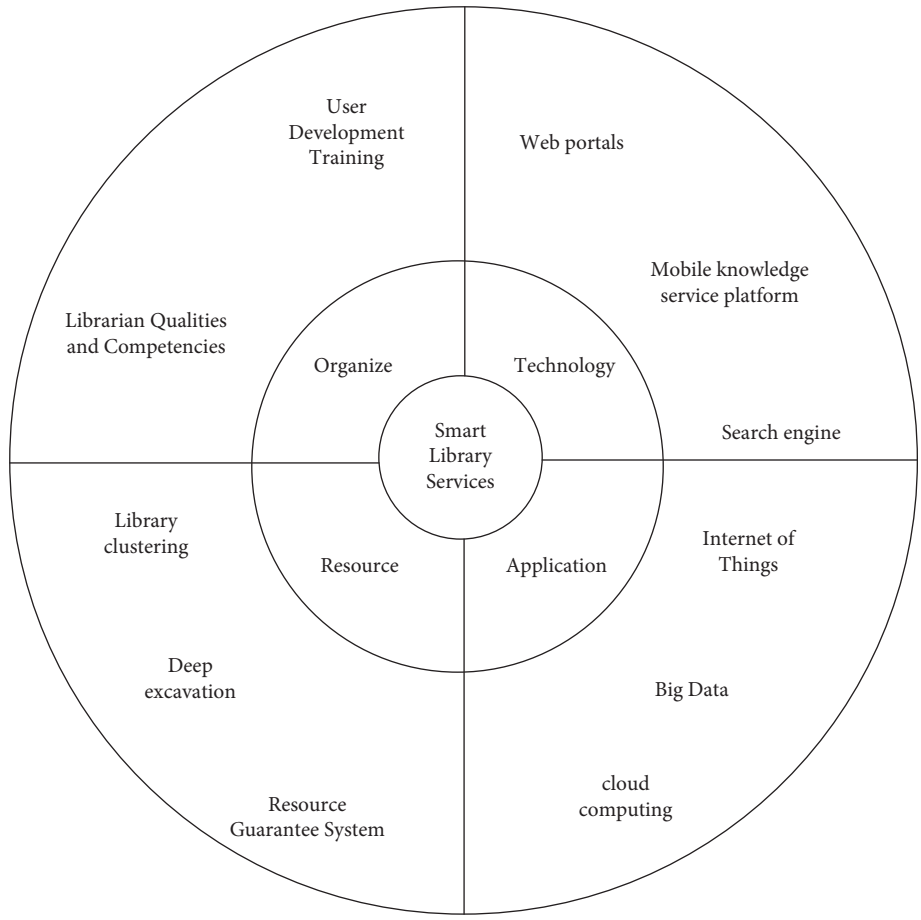


Figure 6: Library knowledge service model.

professional and intelligent system services. In the literature, it is pointed out that the current smart library service is still in the initial stage of research, with three service modes as the main, including decision-support smart service mode, scientific research-based smart service mode, and product development-based smart service mode. The commonality of the smart service model is based on massive resource information and data mining analysis technology. Its essence is a deep-level consulting service, and it also uses information network technology, recommends technology, simulates intelligent thinking, and provides users with an intelligent service model. As an important service means of smart library, the recommendation system has been widely practiced in the library field.

The intelligent service mode based on intelligent recommendation realizes an on-demand and active information intelligent acquisition mode. It relies on the user's behavioral characteristics and interest attributes to establish a correlation model between users and project information, and design a customized intelligent recommendation technology for users to meet users' different, personalized, and diverse information resources. The smart library service model studied in this paper starts from four perspectives. It takes smart recommendation as the main technical support

and taps users' potential information needs through optimized and improved recommendation algorithms. This can help users find the information they need quickly, accurately, and in a timely manner and make intelligent recommendations, intelligent decisions, and intelligent services for users.

## 3. Experiment and Analysis

*3.1. Cloud Library Construction.* Taking our school library as an example, we built an intelligent service system. The equipment required by the system is shown in Tables 1 and 2.

The data center adopts B/S architecture, database access, calculation, query, etc. run on the server, and the software environment information is shown in Table 2.

The service platform constructed in this paper includes hardware and software infrastructure and application programs necessary for the library to provide services. Cloud platform uses virtualization technology to provide users with a unified operating system, a set of application software, and other library applications and services. Users submit service requests through the operation interface of the digital library cloud service platform, and the cloud service platform parses and standardizes the user requests.

Table 1: Hardware facilities.

| Machine type | Number | Software to install |
|---|---|---|
| IBM X3650 | 3 | Oracle |
| HP DL580G7 | 5 | SQL SERVER 2019, MySQL |
| Sun M4000 | 2 | SQL SERVER 2019, MySQL |
| IBM X3850 | 2 | Oracle |

Table 2: Software facilities.

| Software category | Name of software |
|---|---|
| Operating system | Windows SERVER 2019, WindowsXP |
| Database system | Windows SERVER 2019, Oracle |
| Development tools | PowerPoint, Authorware |
| Development voice | Jana, HTML, XML |

*3.2. Platform Effect*

*3.2.1. Search Accuracy.* We first compared the accuracy of the platform's book search. The set score is 1, and the search accuracy is scored according to the ratio, and the accuracy of the search for different numbers of phrases is compared. The result is shown in Figure 7.

As can be seen from Figure 7, as the number of words increases, the book search accuracy of both methods improves. However, neural network algorithms have improved even more. When the number of words is more than 4, the platform constructed by the artificial neural network algorithm can basically find books accurately. The traditional method requires more than 6 words to accurately find the book.

*3.2.2. Data Processing Capability.* In the cloud library intelligent service, the data processing capability of uploading and downloading is extremely important. Therefore, we simulated the data processing capability of the platform built by BPNN and RNN. The structure is shown in Figure 8.

As can be seen from Figure 8, the constructed platform has a good guarantee in terms of data processing speed. The upload speed of data within 100M can be kept within 1 s. The average upload speed of BPNN is around 0.6 s, while RNN can reach around 0.3 s. This shows that the platform built by RNN can play a better effect than BPNN in the data upload method.

In the download of data, the speed of BPNN is also faster than that of RNN. When BPNN downloads 100M of data, the average time is about 1.3 s, while the time of RNN is about 2 s. This shows that BPNN is better than the RNN algorithm in terms of data processing capability.

*3.2.3. Borrowing and Returning Efficiency.* Academic libraries have always been very sensitive to new technologies and are users and promoters of new technologies. To build an intelligent service platform, on the one hand, it can enhance the interactive communication services with readers and users, and on the other hand, it can broaden the service channels and optimize the presentation of information resources. However, the construction of the cloud library intelligent service platform is ultimately to serve people, so the efficiency of book borrowing and returning is very important. We calculated the time required for BPNN and RNN to read and return. The result is shown in Figure 9.

It can be seen from Figure 9 that in 50 simulation experiments, the time spent by BPNN in processing borrowed books is generally about 6 minutes, while the time required by RNN is 10 minutes. However, in the simulation experiment, BPNN experienced two system delays, resulting in more than 20 minutes of time spent. However, when RNN simulates borrowing processing, there is no system delay problem, and the time it takes remains stable. It can also be seen in the book return experiment that the time spent by BPNN is slightly less than that of RNN, but the processing of BPNN is not stable.

*3.2.4. Online Number and Operation Efficiency.* The cloud library intelligent service platform based on the artificial neural network algorithm is an online platform. In order to test the relationship between the number of people online and its operating efficiency, we simulated the operating efficiency of the platform with different numbers of people. The result is shown in Figure 10.

It can be seen from Figure 10 that the running speed of the two algorithms, BPNN and RNN, are generally maintained at a relatively stable stage. However, both algorithms fluctuated as the number of people online increased. However, the fluctuation of BPNN is smaller than that of RNN, which indicates that the BPNN algorithm is better than the RNN algorithm in the overall running process.

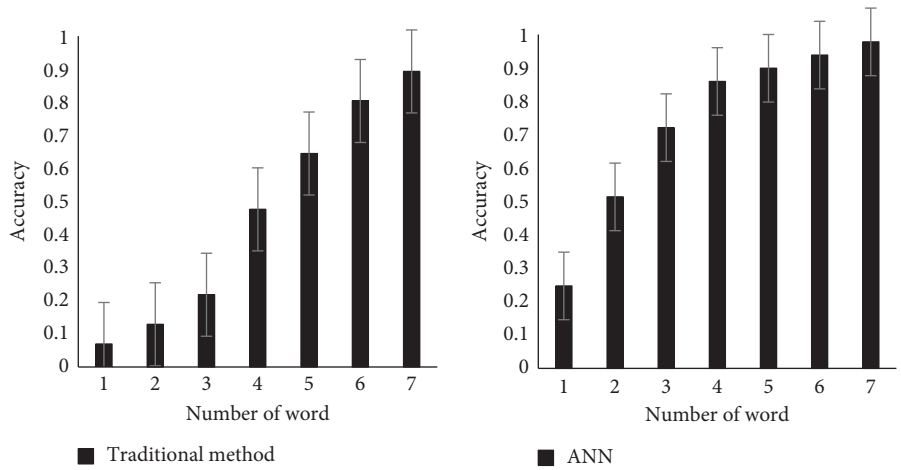


Figure 7: Accuracy when searching for different numbers of phrases.

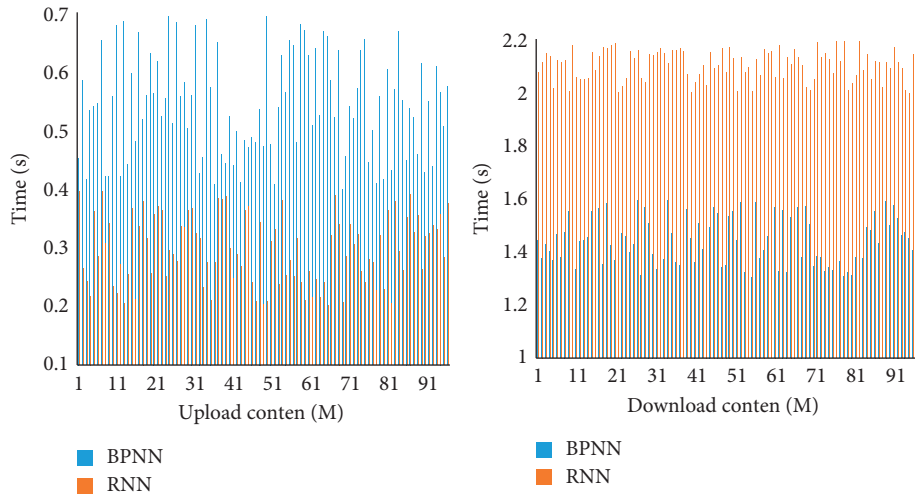


Figure 8: Platform data processing capabilities.

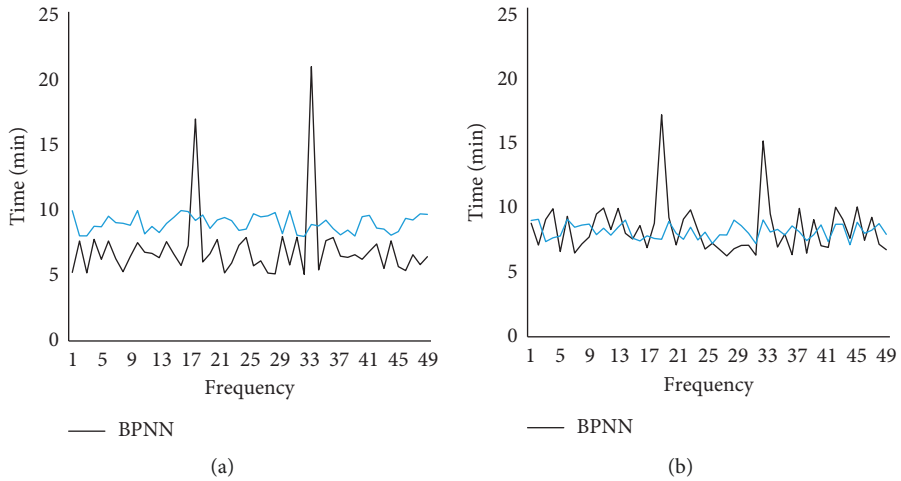


Figure 9: Time required for book borrowing and returning. (a) Book borrowing; (b) book returning.

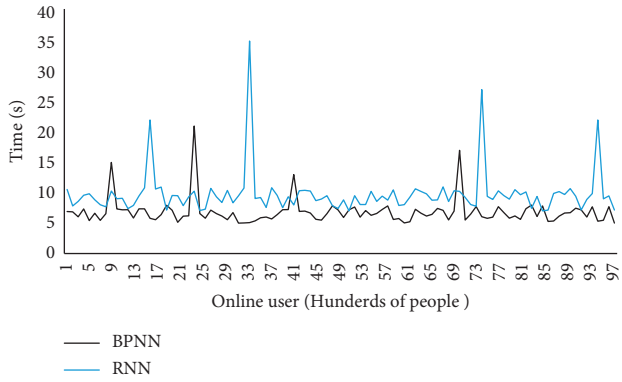


Figure 10: Online number and speed.

## 4. Discussion

Starting from the conceptual connotation, characteristics, principles, and technologies of building a cloud service platform for digital libraries, this paper conducts a systematic study on building a cloud service platform for digital libraries. It plans to use a custom network algorithm to integrate a digital library and create a model of a cloud-based library services platform based on advanced network technology. This book analyzes and compares traditional methods of writing digital library models. It promoted the construction of a digital library based on cloud computing technology and introduced the importance and culture of the first development of the digital library cloud platform.

The intelligent service platform of the artificial neural network algorithm will perform task scheduling and allocation management of the resources obtained through the acquisition mechanism. It is also responsible for digital resource security management, user management, and so on. The user service machine is responsible for collecting data and information sources through equipment, and collecting, sending, and managing data and information sources through organizing and controlling equipment. It is delivered to users through a unified and integrated interface. Collection systems, organizational management systems, and user service units collectively form the cloud of the digital library, and they function together. Retrofit of any equipment will trigger reactions related to other processes, requiring integration and collaboration of other processes.

## 5. Conclusion

Libraries are affected by various technologies. It has gone through several stages from ancient library building to traditional library, to automated library, to digital library, and to compound library. In this paper, the research and comparison of BPNN and RNN algorithms in the artificial neural network algorithm are introduced to realize the information service of smart library in colleges and universities. This completes the automated management system of the library service model. This reduces the labor intensity of staff and enables them to devote more energy to scientific research. However, in order to serve the teachers and students of colleges and universities more perfectly, there are still a lot of problems to be solved and to explore more intelligent information service models. Of course, due to the limited capacity and time of this article, the article also has some deficiencies. For example, it only compares the RNN and BPNN algorithms in the artificial neural network algorithm and does not introduce other intelligent algorithms, and the results obtained also have certain errors. In the future work, we can rely on different intelligent algorithms to popularize the installation and popularization scope of book borrowing and returning terminals. This enables library resources to be opened up and breaks the shackles of time and space. It can also realize the possibility of system remote management and real-time circulation of books through the push of terminal points, etc., and realize the increase of circulation times in the book cycle. The further development of the smart book information service system in colleges and universities can use the mobile device library platform for subsequent docking on the basis of this information service system, and realize a more efficient and intelligent library information service system through the construction of the mobile platform.

## Data Availability

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

## Conflicts of Interest

The authors declare no conflicts of interest.

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