Application of Data Mining Based on Computer Algorithm in Personalized Recommendation Service of University Smart Library

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Abstract: Smart library is an important channel to improve the reading ability of college students. It is an important means to cultivate students' reading interest and cultivate the reading style of the whole people. The wisdom library focuses on wisdom, including service intelligence, management intelligence, and facility intelligence. In the process of promoting smart libraries, big data computing is at an important position, and computer algorithms are the core technology support. Therefore, it is of great significance to combine computer algorithm data mining with computer algorithms to analyze the application of data mining in the personalized recommendation service of university libraries. This paper analyzes the application of computer algorithm and big data mining technology in the personalized recommendation service of smart library, analyzes readers' reading preferences and behavior habits, and proposes three measures for reference.

1. Introduction
In the current "Internet +" context, the library's ability depends not only on its size, but also on its intelligence. There is an urgent need for a society to provide a personalized library that is personalized, mobile and intelligent. At present, in the context of the era of wisdom, the "smart library" is pushing the transformation of university libraries from traditional borrowing to smart services, from paper-based to digital-based, from passive to active, and from commonality. Personality changes, the library's information resource service model is in the midst of profound changes, opportunities and challenges coexist. Applying big data mining technology can improve the level of intelligence, personalization and automation of knowledge services. The core of realizing this intelligent service is computer algorithm. Big data mining based on computer algorithm can accurately analyze the reading behavior and browsing habits of college readers. Through user group mining, user interest mining, subject knowledge mining, business association mining and other big data. To provide readers with a more personalized recommendation service. Therefore, this paper adopts the method of integrating computer algorithm and data mining technology, analyzes the personalized recommendation service of the intelligent library, establishes the user demand model, and proposes the recommended measures.

2. The association between computer algorithms and data mining in smart library applications

2.1. Computer Algorithm and Data Mining
As an important branch of computer science, algorithm plays a central role in computer science. Computer algorithms are the forerunner of computer work, and are a detailed description of the
computational processes performed on computers. They are mainly applied to the execution of programs or system logic, which form a computer program with the data structure. The computer work process is mainly characterized by selecting a most suitable algorithm according to the specific situation, and executing the computer algorithm designed by people in advance to solve the practical problem. The characteristics of computer algorithms are deterministic, finite, effective, etc., including non-numerical algorithms and numerical algorithms. In the information age, computer algorithms, as one of the important tools for solving problems, solve the required output for obtaining information in a short period of time by inputting information that conforms to the specifications. It has been widely used in fields such as library self-service.

Big data mining is one of the key technologies that make library big data work. Internet technology has brought unprecedented breadth and depth to the interconnection and collaboration between library resources, users, users and resources. In particular, with the diversification of reading terminals and the widespread use of social tools, a comprehensive and three-dimensional library big data has been formed. Data mining objects mainly include user data, knowledge resource data, and business process data. In smart library self-service, big data mining technology is a bridge to communicate the needs of library big data applications and smart services. In this respect, there are mainly user group mining, user interest mining, subject and domain knowledge mining, business association mining, etc. The purpose is to achieve accurate service to users by calculating different behavior habits and interests of users.

![Figure 1. Library smart service model based on big data mining](image)

The core technology of data mining is the computational calculation method. By inputting the data into the computer program, the computer performs calculation according to the predetermined program, and finally analyzes the behavior of the reader reasonably, so as to realize the personalized personalized push according to the user's behavior habits and hobbies. purpose.

2.2. Overview of research on smart libraries
The status quo of foreign research. Foreign scholars mainly study and discuss from the perspectives of definition, characteristics, service principles, service functions, service means, service objects or service evaluation of smart libraries. Betsy Bakery believes that in the context of the information age, the primary and core value of library existence and survival is to serve readers. Aittola of the
University of Oulu Library in Finland pointed out that the smart Library is an indispensable part of the future smart city service construction. Knijnenburg has developed a new perspective on the development of recommended systems, supporting the participation of users in the R&D design process of the recommendation system, and better tapping the unique preferences of users. Scholar Bilandzic uses questionnaires and other methods to study the use of digital resources and learning behaviors of library readers, and summarizes the information service model of smart libraries from the perspective of readers. Giyeong Kim suggested that smart libraries should have a market model and an evaluation model. Zavadskas EK et al. envisioned a model for intelligent libraries that would support integration to the greatest extent possible, and then improve the effectiveness of library services by analyzing data resources and information resources. Isinkaye et al. explored various recommendation systems in terms of features and technical potential, and explained the application of various prediction methods in recommended techniques.

Research state in China. In this paper, the "Recommended System" and "Smart Library" are the main keywords, and relevant searches are carried out in the CNKI academic literature database. The results are shown in the figure.

It can be seen that in recent years, the number of relevant academic materials on smart libraries has risen, and smart libraries have gradually become the focus of research in the field of libraries. The research on the intelligent library mainly includes two aspects: theory and practice. The theoretical research mainly involves the academic review literature such as the definition, development process, characteristics, service realization mode and mode construction of the smart library. The practical research focuses on the wisdom library. technical level. However, on the whole, the theoretical research on domestic smart libraries has just started, and the research on recommendation systems mostly stays at the technical level, while the research on combining recommendation systems with smart libraries is rare.

3. Application of Computer Algorithm in Personalized Recommendation Service of University Smart Library

3.1. University Smart Library

At present, the definition of a smart library will be described differently from different perspectives and different channels. There are also distinctions between university libraries and public libraries on
Regarding the smart library in the library community has not yet been relatively formal unification, Wang Shiwei believes that the wisdom of the library is the digital benefit of the people, the information technology means is supported, the characteristics are interconnected and convenient. Yan Dong pointed out that the smart library = library + Internet + cloud computing + smart devices, through a smart model, ultimately achieve the purpose of smart library intelligent service. Li Kaixuan proposed, smart library = intelligent building + information resources + librarian + cloud computing + intelligent equipment. Combining relevant literature research, this paper believes that smart library is a library that relies on certain technologies to provide resources and readers by providing various intelligent services to provide personalized and intelligent services. Digital library is the premise and foundation of the existence of smart library. The intelligent library is the development direction and trend of digital library. The smart library mainly includes the characteristics of intelligent building, intelligent wisdom, intelligent management, intelligent service, and intelligent communication.

![Smart library features](image)

**Figure 3. Schematic diagram of the smart library**

### 3.2. Personalized recommendation of domestic university libraries

The personalized recommendation service of the library is based on the user's needs. It refers to the analysis of the differences between the individual and the social group's knowledge structure from the reader's user behavior needs and interests, and then provides the readers with the book resource recommendation service.

To put it simply, by creating a reader user model, look for the reader information that is closest to its similarity or the resource information that is most similar to its interest, helping readers save time and mining valuable, potential, and diverse books for readers. The recommendation system of domestic university libraries has its own particularity. The main performance is that the information resources of university libraries are very rich and cover a wide range; the readers and users are mainly based on the teachers and students of the school, with a high degree of specialization and relative stability; the recommended objects are relatively simple, mainly based on the text information of books. This makes the library collection resource recommendation system have its own superiority, which is easier to implement technically and more easily supported by users.

The further upgrade of personalized recommendation is intelligent recommendation, which is essentially a two-way service mode in which "people find information" and "information find people".
The recommendation system has different classifications according to different angles and standards in different fields. At present, the mainstream recommendation system technologies at home and abroad have three types based on content recommendation system, recommendation system based on collaborative filtering recommendation, and hybrid recommendation system. The classification of the recommended system technical framework is shown in the figure.

![Recommended method](image)

Note:
1 — — Clustering  2 — — E-commerce  
3 — — Association  4 — — Library  
5 — — Decision making  6 — — News  
7 — — Analysis  8 — — Music  
9 — — Return  10 — — Tourism  
11 — — Inspire  12 — — Film  

Figure 4. recommended technical classification framework

4.Application of Computer Algorithm in Personalized Recommendation Service of University Smart Library

4.1. Library Personalized Recommendation Model Construction
The information needs of college readers rely heavily on the background of professional knowledge. At the same time, readers' borrowing information can present the overall direction of readers' information needs. This paper takes South China University of Technology as the research object, and designs the secondary school and the number of majors in the whole school as vectors. Based on this, we created the reader multidimensional feature model N, taking values 0 and 1. This model includes the faculty vector N_1, the professional vector N_2, the academic vector N_3, the character vector N_4, and the borrowing vector N_5.

Target audiences have recently integrated. The book borrowing amount in the statistical period of time in which the reader and the target reader are found in the recent candidate M is represented by the set U. Based on M and U, establish a user matrix, denoted by A(m,n), matrix A(m,n) contains n target readers, and set V = ( u_1, u_2, ... u_m) and n book books The set of information resources I=(i_1, i_2, ..., i_n). The score of the reader u for the book i is represented by the matrix element R. If the reader u does not have a borrowing behavior for the book i within a certain period of time, remember that R_{ui}=0. If the reader has a borrowing behavior during the statistical time period, since the length of the borrowing time reflects the reader's long-term preference to a certain extent, the value of R_{ui} is determined according to the borrowing time.

Formula calculation. Set in a certain statistical time, the reader borrows the book sequence (item_1 , item_2 , ..., item_m , ... , item_n ), and the corresponding borrowing time sequence is (t_1 , t_2 , ..., t_i , ..., t_n). Calculated as follows:
Based on the user-project matrix, the closest integration to the target reader is calculated by correcting the cosine similarity formula. Calculated as follows:

\[
R_{ui} = \frac{t_i - T_{\min}}{T_{\max} - T_{\min}}
\]  

(1)

Produce a recommended bibliography. Based on the score data of the target reader's nearest neighbor to the book resource, the target reader's interest preference \( P_{ui} \) can be predicted. Then, by setting the number of recommended books, or the reader's interest preference, a book resource recommendation is generated for the target audience. Using the formula based on the weighted average of the project mean, the book resource is scored and predicted within the nearest neighbor set of the target reader. Let the nearest neighbor set be \( U \), be \( P_{ui} \) target reader u interest preference for book i, then \( P_{ui} \) can use the target reader's nearest neighbor set to calculate the score data of book i. Calculated as follows:

\[
P_{ui} = R_u + \frac{\sum \bar{z} \beta \prod \text{sim}(u, n) \ast (R_{ui} - R_N)}{\sum \exists \beta \text{E[\text{sim}(u, n)]}}
\]  

(3)

4.2. Specific application

In the smart library, the application of computer algorithms also plays an active role in promoting the intelligent personalization of libraries. The following should be mentioned. The first is the divide and conquer method. When analyzing the reader's needs and interests, the problem instance can be decomposed into several small problem instances, and then these small problem instances are solved sequentially by recursive method, and then the obtained solutions are combined to obtain The solution to the big problem instance. Secondly, the graph algorithm can solve problems such as the reader reading order by using the graph algorithm. Finally, the dynamic programming algorithm is a kind of algorithm strategy that decomposes a large problem instance into several small sub-problems and obtains the optimal value by recursive method to obtain the optimal solution of the problem. Applying dynamic programming algorithms to smart libraries can effectively analyze and process the overlap and correlation between data.

5. Recommended measures

The core service model of library smart service has at least four aspects, namely, intelligent group knowledge sharing, intelligent knowledge recommendation and push, intelligent knowledge navigation and intelligent library business optimization. The survey found that there is still a big gap between the recommended services of university libraries and the true smart library service model. In order to further promote the construction of the recommended service system for high-level university libraries and improve the smart service model of smart libraries, among the above four service models, computer algorithms have a large application space. To address the above issues, make the following recommendations:

5.1. Strengthen the smart recommendation service of university smart libraries.

Wisdom recommendation is an important means for smart libraries to provide services. It only provides personalized customization and new book recommendation services. The diversified, real-time and increasingly rich information resources of readers have not received real attention. The recommendation technology should be used, combined with the user's own background, to make a variety of real-time personalized recommendations. The reader user should be the core, according to the different periods, different backgrounds and different characteristics of the users, analyze and
explore their behaviors and needs in depth, establish user core models through technical algorithms, predict readers' user preferences, and proactively give recommendation services in a timely manner.

5.2. Pay attention to the diversity of wisdom recommendation results.
Current recommendation system services tend to focus on recommendation system results, while ignoring the diversity and novelty of recommendation results, which may not be a good recommendation for users. In order to provide more accurate recommendations, to explore the resources and information that users are interested in, the library smart recommendation service should improve the accuracy, while taking into account the diversification and novelty of recommendation results, and improve readers' satisfaction and surprise.

5.3. To strengthen research and development capabilities.
In order to enhance their own research and development capabilities, university libraries should make full use of their own information sources to gain convenience and other advantages, and further understand the deeper needs of readers, make full use of the hidden or explicit information of college teachers and students, and make full use of data. It is necessary to enhance its own system design and research and development capabilities, provide readers with better quality recommendation services, develop a truly intelligent recommendation service system, and jointly improve the smart library service model of colleges and universities, and truly realize the wisdom and value of the library.

6. Conclusion
The combination of computer algorithms and data mining plays an important role in improving the quality of smart library services. Computer algorithms are essentially a kind of computing process. The intelligent library is essentially a means of realizing high-quality services through calculation. Therefore, improving the level of computer algorithms is essentially improving the service quality of libraries. Computer algorithms have been widely used in many fields, especially with the development of the Internet and the rise of artificial intelligence. Undoubtedly, promoting the construction of smart libraries is an important direction for the development of university libraries in the future. After the analysis of this article, we believe that it is not a simple matter to do a good job of personalized recommendation service for colleges and universities. In particular, it is necessary to strengthen scientific and technological innovation, combine the latest achievements in scientific and technological innovation with the construction of a smart library, organically integrate computer algorithms with the construction of smart libraries, and contribute to the provision of more humanized services for university readers, thereby improving the university library. The ability and level of serving students.

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