Research Article

Application of Probabilistic Random Matrix Management Mode in Student Information Management for Higher Education

Yongqiang Sun

Academic Affairs Offices, Huaiyin Normal University, Huaian, Jiangsu 223300, China

Correspondence should be addressed to Yongqiang Sun; sunyongqiang@hytc.edu.cn

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Traditional management method of student information is not only slow in operation, poor in confidentiality, and low in work efficiency, but also prone to statistical errors and data loss, which can no longer meet the needs of new situations. Probabilistic random matrix management mode can effectively coordinate the development of various businesses and strengthen their information flow through horizontal and vertical management across functional departments. On the basis of summarizing and analyzing previous literature, this study expounded the research status and significance of student information management of higher education, elaborated the development background, current status, and future challenges of probabilistic random matrix management mode, introduced the methods and principles of probabilistic matrix factorization algorithm and random matrix factorization model, discussed the service and supervision functions of student information management, analyzed the incentive and guiding functions of student information management, conducted the process analysis of student information management for higher education based on probabilistic random matrix management mode, established student identity document and student status management modules, designed student scholarship, statistics, and data management modules, constructed a student information management system for higher education based on probabilistic random matrix management mode, and finally carried out a case application and its result analysis. The study results show that the probabilistic random matrix management mode is a combination of linear and flat organizational structures and has the advantages of short information lines, fast information feedback, and high operation efficiency; it can input the matrix form of prior data and use statistical probability knowledge to derive the probability density function of posterior feature vector and predict the recommendation result through feature vector. The probabilistic random matrix management mode first calculates student’s behavior sequence through their management information and then calculates the student’s preference sequence according to their behavior sequence and label information and subsequently calculates the similarity matrices about the students and their information and finally integrates the obtained student similarity matrix into the probabilistic matrix factorization model.

1. Introduction

Student information management in colleges and universities is an important part of the management of higher education. The success or failure of the student information management directly affects the quality of education and teaching in colleges and universities and affects the teaching order. The student information management in higher education is the basis of electronic registration, and ensuring the submission of true and accurate student data is an important content and task of management [1]. The management of higher education student information should gradually break through the restrictions between various types of education and advocate interactive learning and mutual recognition of achievements between various learning forms. The content of student information management of higher education involves the registration of new students, the review of the admission list, the review of student information changes, and the review of the student registration list [2]. The traditional manual management method not only has high labor intensity, slow operation speed, poor confidentiality, and low efficiency, but also is prone to statistical errors and data loss [3]. The use of computer means to carry out traditional manual
management methods to improve the efficiency and level of management, for example, the development of the student information management information system in universities, can reduce errors in manual operation process, avoid fraud, and improve work efficiency [4].

As an evolution of organizational structure, the matrix management mode is a combination of linear and flat. Probabilistic random matrix itself is a mathematical concept, an algebraic method of solving problems by establishing the structure of the system [5]. The probabilistic random matrix management mode is characterized by strong interactivity, safe access mode, low network traffic, and fast response speed and is conducive to processing large amounts of data. As a representative model-based collaborative filtering algorithm, the probabilistic random matrix factorization algorithm is widely popular due to its high accuracy and scalability. Therefore, matrix management is a good supplement to linear management and is mainly suitable for frequent changes in work content [6]. The completion of each job requires an organization supported by many technologies and knowledge or as a supplementary structural form when arranging temporary tasks. The probabilistic matrix factorization recommendation algorithm has improved management prediction accuracy, but the algorithm often faces the disadvantage of sparse data in practical applications, and the utilization efficiency of the existing data is not high [7]. The algorithm is superior to the traditional recommendation algorithm, and from the perspective of students or student information, the integration of student behavior sequence information can improve the accuracy of management prediction. The probabilistic random matrix management mode includes the management information of students and the label information of student information, but there is no information such as students’ social trust [8].

On the basis of summarizing and analyzing previous literatures, this study expounds the research status and significance of student information management of higher education, elaborates the development background, current status, and future challenges of probabilistic random matrix management mode, introduces the methods and principles of probabilistic matrix factorization algorithm and random matrix factorization model, discusses the service and supervision functions of student information management, analyzes the incentive and guiding functions of student information management, conducts the process analysis of student information management for higher education based on probabilistic random matrix management mode, establishes student identity document and student status management modules, designs student scholarship, statistics, and data management modules, constructs a student information management system for higher education based on probabilistic random matrix management mode, and finally carries out a case application and its result analysis. The detailed chapters are arranged as follows: Section 2 introduces the methods and principles of probabilistic matrix factorization algorithm and random matrix factorization model; Section 3 conducts the process analysis of student information management for higher education based on probabilistic random matrix management mode; Section 4 constructs a student information management system for higher education based on probabilistic random matrix management mode; Section 5 carries out a case application and its result analysis; Section 6 is the summary and conclusion of the whole paper.

2. Methods and Principles

2.1. Probabilistic Matrix Factorization Algorithm. Let \( a_i \) \( (i = 1, 2, \ldots, n) \) be the probability of measuring the ith row of matrix A. To ensure democracy between measurements, each measurement should have the same statistical validity. Therefore, in the design of probabilistic random matrix, the probability of row vector \( A_i \) of random matrix is defined as follows:

\[
A_i = \sum_{j=1}^{n} \left( \frac{b_j}{a_i} \cdot \frac{d_j}{c_j} \right) = \sum_{j=1}^{n} \left( \frac{b_j}{a_i} \cdot \frac{f_j}{e_i} \right),
\]

where \( b_j \) is the probability of the measurement matrix, that is, the ratio of the number of nonzero elements of the matrix to the total number of elements; \( c_i \) is the measurement value vector; \( d_j \) is the measurement matrix; \( e_i \) is the vector composed of transformation coefficients; \( f_j \) is the zero norm of the signal, that is, the number of signal values that are not zero.

A management mode is integrated into the probabilistic random matrix, and the student information matrix and management mode matrix are decomposed at the same time to obtain a potential student information feature space; according to the shared feature space, the student information matrix and the management mode matrix are compactly linked, and the probabilistic random matrix. The posterior distribution which recommended by the management model can be obtained by taking the logarithm:

\[
B_{ij} = \prod_{i=1}^{n} \prod_{j=1}^{m} \left( \frac{1}{g_{ij}} - \frac{1}{h_{ij}} \right),
\]

where \( B_{ij} \) is an indicator function; if a random matrix is satisfied between the student’s student information \( i \) and the student’s status information \( j \), its value is 1; otherwise it is 0; \( m \) is the total number of student information; \( g_{ij} \) is a constant that does not depend on parameters; the optimized posterior distribution function is equivalent to the minimized objective function; \( h_{ij} \) is used to adjust the proportion of the impact of the student rating matrix and the student information matrix on the recommendation result.

When the probability sparse random matrix is selected as the measurement matrix, the distribution of effective projection nodes is relatively concentrated, while when the sparse random matrix and the sparse measurement matrix are selected as the measurement matrix, the effective projection nodes are evenly distributed in the entire monitoring area. This is because the design of the probability sparse random matrix makes full use of the position distribution information of nodes and controls the probability of nodes being selected as valid projection nodes, so that the
distribution of valid projection nodes corresponding to the same measurement value is as centralized as possible [9]. The algorithm describes the student information from a new perspective in the form of a matrix; according to the value of the random matrix, the researcher can intuitively understand whether a student belongs to a certain random. While the other two sparse constructions of the matrix do not consider the position distribution information of the nodes, the effective projection node distribution is very scattered. The database content is placed on the server, and the corresponding software is installed on the client for calculation and processing. It is characterized by strong interactivity, safe access mode, low network traffic, and fast response speed and is conducive to processing large amounts of data; however, the program of this structure has poor compatibility and is difficult to maintain and manage.

2.2. Random Matrix Factorization Model. Assuming that there are \( m \) students and \( n \) types of student information in the management system, the probability matrix \( C_{m \times n} \) of student information is formed; the student information probability matrix \( C_{m \times n} \) is composed of \( m \times n \) elements \( c_{ij} \); \( k_{ij} \) represents the relationship between student \( i \) and student information \( j \). The probability matrix can reduce the dimension of the original data and mine the implicit features of the data. Even in the face of sparse data and high-dimensional data, it still has excellent recommendation performance:

\[
C_{m \times n} = \frac{q}{p} \begin{bmatrix}
    k_{i1} & k_{i2} & \cdots & k_{in} \\
    k_{21} & k_{22} & \cdots & k_{2n} \\
    \vdots & \vdots & \ddots & \vdots \\
    k_{m1} & k_{m2} & \cdots & k_{mn}
\end{bmatrix},
\]

where \( i \) is the student number; \( j \) is the student information number; \( l_{ij} \) is the student’s implicit feature vector; \( a_{ij} \) is the information implicit feature vector; \( p \) is the feature vector dimension; \( q \) is the attribution value of the student’s student information probability matrix.

According to the state combination rule of the probabilistic random matrix, the elements in the upper left area of the random matrix \( D_{ij} \) are the joint probability of output advance, the elements in the lower right area are the joint probability of output failure, and the remaining elements in the middle column are the probability of output states \( r_{ij} \) from top to bottom:

\[
E_{ij} = r_{ij} + \sum_{i,j=1}^{n} (r_{ij} - s_{ij}) + \sum_{i,j=1}^{n} (r_{ij} - t_{ij}),
\]

where \( E_{ij} \) is the state probability of the input signal, representing the state value of the signal flow; \( 0 \) represents the advance state, \( n \) represents the fault state, and \( 1 - (n - 1) \) represents a variety of successful states \( (0 - n) \) can also represent timing problems multiple time points; \( s_{ij} \) is the input state probability matrix; \( t_{ij} \) is the output state probability matrix.

As a representative model-based collaborative filtering algorithm, the probabilistic random matrix factorization algorithm is widely popular due to its high accuracy and scalability. The probabilistic random matrix factorization algorithm uses the knowledge of statistical probability to obtain the probability density function of the posterior eigenvector by inputting the matrix form of the prior data and predicts the recommendation result through the eigenvector. Eigenvectors are the output results of the matrix decomposition algorithm, and their potential information is richer than the original data. Analyzing the eigenvectors is helpful to understand the principle of the algorithm [10]. The random matrix describes the student information from a new perspective in the form of a matrix; according to the value of the random matrix, the researcher can intuitively understand whether a student belongs to a certain random. If the affiliation between the student and the random is known, the researcher can build a random matrix. Through the random division algorithm, the student registration information can be expressed in a random form. The random matrix can be decomposed to obtain the random characteristic matrix of students and the random characteristic matrix. Since the random characteristics of students will have an impact on the characteristics of students, the random adjustment parameters are defined, and the probabilistic random matrix decomposition of the joint scoring matrix is deducted.


3.1. Service and Supervision Functions of Student Information Management. The probabilistic random matrix is an improvement to the random matrix and its core idea is to identify the particles with high likelihood value for the observation value at the next moment through an auxiliary variable and then use these particles with high likelihood value for filtering and summarization to improve the accuracy of the estimation. Therefore, the probabilistic random matrix management mode is very suitable for handling the state estimation problems of hybrid systems such as manoeuvring target tracking. According to the characteristics of the probabilistic random matrix, the likelihood values of the sampled particles in each model can be accumulated, and the accumulated sum of the results can be regarded as the likelihood value of each model. After such processing, the likelihood values of the particles identified by the auxiliary variables can not only be used to calculate the probabilities of each model, but also be used for online estimation of the transition probability matrix at the same time. The management of higher education student information should gradually break through the restrictions between various types of education and advocate interactive learning and mutual recognition of achievements between various learning forms. In order to adapt to all kinds of students’ learning and alleviate students’ work-study
conflicts, and family-study conflicts, the probabilistic random matrix management mode can break the restrictions between various school-running forms and realize the organic combination of various forms. The student information management system can stipulate the minimum number of course selections for students each semester and must strictly enforce the discipline of attendance and strengthen the daily management of students.

Figure 1 shows the framework of process analysis of student information management for higher education based on probabilistic random matrix management mode. According to the specific situation of transferring schools and majors, according to the teaching requirements, the same or similar relevant information that can be identified is logged in the first form, and the relevant information that cannot be identified at all with large differences is logged in the second form. The credits that are not recognized in the second form can be used as supplementary credits when students graduate from optional courses, so it is very beneficial for students to recognize their scores in time. The probabilistic random matrix management mode also opens the online course selection channel according to the specific situation of the students. For the compulsory courses that have not been taken, the students should make up-election and supplementary courses in time to obtain the corresponding credits, so as to avoid the remaining problems caused by the transfer of schools and majors. This requires students engaged in student information management to pay more attention to the improvement of comprehensive business ability on the basis of strengthening theoretical study and to use the educational administration system software more carefully [11]. The probabilistic random matrix management mode combines student information management and course selection management and is no longer treated in isolation, which gives full play to the role of computer software and is more efficient in student information management. This mode manages the application system as much as possible and at the same time consciously explores the corresponding requirements for system redevelopment.

With the deepening of the reform of the internal management system in colleges and universities, this team is also faced with new tasks and requirements. Only by correctly analyzing the main problems existing in the construction of the university student information management personnel team, adopting scientific management methods and methods, strengthening training, and continuously improving the quality, can the university student information management personnel team be better built [12]. The student information management in colleges and universities has its own subject knowledge background, which is the product of the combination of educational practice and management laws. It has its own unique research objects, research contents, and research methods, which cannot be replaced by other disciplines. Taking the management of school status as a science and an art, the model should seriously study the laws of school status management and maximize the role of the school’s material and financial resources, so as to achieve the highest work efficiency and exchange for the best benefits. The student information management is a very specific, complicated, and highly policy-oriented work. The student information management should also actively adapt to the development of the new situation, update concepts, and enhance the awareness of management and education. According to the requirements of different training stages, the establishment and change of student information, electronic registration, graduation diploma and degree, etc. should give full play to their influence. The service role and policy-oriented role of the teaching process improve the management level.

3.2 Incentive and Guiding Functions of Student Information Management. The probabilistic random matrix management mode does not necessarily deny the past professional division of labor theory but is an effective supplement and reform of the original professional division of labor theory. The student information management in colleges and
universities is a work with strong principles and policies, which not only has strict regulations on the student information management, but also has a sound legal basis. At the same time, the student information management also has a certain degree of flexibility. In the process of normal student information processing, various specific problems are often encountered, which requires a combination of principle and flexibility for fair and proper handling. As shown in Figure 2(a), the proposal and development of the theory of probabilistic random matrix management mode is precisely because of the traditional division of labor business logic, which brings bad customer experience to users and reduces work efficiency. As shown in Figure 2(b), the business probabilistic random matrix management mode will reorganize the business facing customers, so it can more effectively adapt to the customer-centric management system; while the student information management is just a typical management system, the student information management must serve students. Therefore, the existing student information management affairs cannot simply be moved to the computer for processing, and the traditional working methods and methods and procedures of the student information management must be reexamined, and the necessary cleaning, simplification, optimization, integration, and transformation must be carried out [13].

If these inputs are not completely independent, the output probability needs to be modified. For simple systems, in the probability expansion of the output signal, the probability of the high-order term of the common signal can be directly replaced by the first-order term. But for complex systems with multiple common signals and multiple logic gates, the derivation and calculation process of the probability expansion will become very complicated. The student information management is the management of student identity document card first; the function of student identity document card query can be used by anyone, but the modification and deletion of student identity document card must be the responsibility of a special person, so the authority is specific to the module [14]. The student information management changes has been transformed from the original paper and pen records to the storage in the machine, which is convenient for searching and statistics; various statistics are made on the above data, and the student information number is used as the keyword to query and modify them (Figure 3). The reward and punishment system and scholarship evaluation are now entering the student’s reward and punishment according to the grade and linking him with the integrity file in the work-study program, so that the basic situation of a student can be known based on natural information. The scholarship evaluation is integrated into the student information management and the faculties and departments conduct a three-level evaluation and then import the above data into the student information management of the student affairs office, and a special person will conduct a comprehensive evaluation.

Colleges and universities should plan to strengthen the training and construction of the professional quality of student information management workers and establish and improve the continuing education mechanism. The probabilistic random matrix management mode can adopt a multilevel, multichannel, and multiform continuing education method according to the different knowledge levels and professional characteristics of the student management personnel, combining theoretical training with practical training, domestic training and overseas training, short-term training, and vocational education. Colleges and universities should affirm the status and role of student information workers and not only make reasonable adjustments to the structure of the school’s student information management team, but also establish an effective talent incentive mechanism. The construction of the student information management system in colleges and universities must follow the requirements of the law. The school student information management system must not only maintain the seriousness of the system, but also safeguard the legitimate rights and interests of students. If a job is highly specialized and relatively single, then it is not suitable for the business probabilistic random matrix management mode. From student registration, student information change, and grade entry to graduation, it runs through the complete learning process of students. It can be said that the process of student information management is a highly concentrated process for students to receive higher education and the student information management has distinct process characteristics. The programmatic content of student information management refers not only
to the flow of management procedures, but also to the standardization process of school status management.

4. System Construction of Student Information Management for Higher Education Based on Probabilistic Random Matrix Mode

4.1. Student Identity Document and Student Status Management Modules. The system database is mainly designed from three aspects, namely, information management, achievement management, system maintenance, and help information. The choice of data table directly affects the integrity of student information management, data redundancy, and data response speed and thus affects the use of students. In order to meet the requirements of student information management, the database of this system has been established including student number, class number, name, gender, date of birth, nationality, place of origin, political identity, health status, identity document number, mailing address, postal code, contact number, and professional fourteen data sheets including code, class code, notes, and photos [15]. Student information management is not an isolated task, and it is closely related to other teaching management links. Therefore, in order to avoid and eliminate the occurrence of various problems in the process of student information management, the entire teaching management team needs to establish quality awareness, implement process control, and implement fine-tuning. As shown in Figure 4, the joint school between schools is very complicated, and it is necessary to do a good job in teaching management and student management in order to receive the expected results. The charging scheme of the school will enable the smooth implementation of the joint school-running between schools.

The application of probabilistic random matrix management in student information management of higher education can make up for the insufficiency of the linear functional teaching management model and realize the organic combination of project management and linear functional management. Vertically, it is a linear functional management, which is macrocontrolled by the school level, and the department is responsible for process management, which conforms to the law of teaching management; horizontally, it is project management, and the project leaders are responsible for each project. It is organized according to the project, overcomes the phenomenon of division between departments and blaming each other, strengthens the connection between school and society, management department and department, and department and department and overcomes the disconnection of various departments in the linear functional structure (Figure 5). It is flexible and can be organized or disbanded with the beginning and end of

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Figure 3: Probabilistic random matrix in the student identity document (ID) (a), status (b), data (c), and scholarship (d) management.
a project. One person can also participate in several project teams at the same time, which greatly improves the utilization rate of personnel. Staff are directly involved in the project and have a say in important decision-making issues, increasing the accountability and motivation of the participants. Through the combination of horizontal and vertical management, staff can get in touch with staff in the subject area and also have the opportunity to communicate and cooperate with experts and teaching administrators and gain access to more knowledge and skills.

Personnel in the higher education student registration management system should have an open and inclusive awareness, widely receive information from various channels, and ensure vertical distribution of superior and inferior information. All colleges and universities should communicate with each other, realize real-time information feedback with each teaching point, realize open management, and realize the linkage of horizontal management system. The management of higher education student information is actually a criss-crossed management system, with the ministry of education, the department of education, and colleges and universities vertically and colleges and affiliated units horizontally. The linkage of the three-level management system formed by the ministry of education, the department of education, and colleges and universities has played a key role in the standardization and high-quality operation of the entire management system [16]. The probabilistic random matrix management mode is a two-layer structure mode in which the client and the server jointly realize cooperative processing. Because the degree of difficulty of the course is different, the class time is different, the number of credits is different, and it includes the management of students and teaching management. For problems that have occurred, no matter how big or small, they must be submitted to the leaders, and the management personnel of each link should be brought together to discuss and analyze, reflect in time, strengthen the review of their own quality management, predict and control possible problems, and gradually eliminate the graduation export link. In the state of terminal inspection, focus on prior control and pursue continuous improvement.

4.2. Student Scholarship, Statistics, and Data Management Modules. The overall design of the student information management of higher education system should be based on the design concept of systems engineering, which manages student information data through network information sharing, making it extremely easy for operators to view information about students and their colleges through a browser. Because the mode is managed through a probabilistic random matrix, the security problem has always been the primary problem to be solved in information sharing in the network. In order to solve the problem of network security, a two-level security guarantee system is adopted in the student information management system. The
management efficiencies of student identity, scholarship, statistics, and data with probabilistic matrix factorization algorithm and random matrix factorization model are shown in Figure 6. The probabilistic random matrix student information management model closely integrates teaching plans, course modules, course selection mechanisms, and evaluation systems by setting academic credits and comprehensive quality credits to ensure the normal operation and efficient implementation of the entire student information management model. In order to ensure the authority of data and the of information security, the authority and responsibility for the use of online information are stipulated. The characteristics of this system include strong practicability, strong security, fast system operation, and flexible use of the system and information; it can reduce errors in manual operation, avoid fraud, and enable better student information management.

The management mode is divided into two types: linear and flat according to its management level. The linear structure is similar to a pyramid. Usually, the management mode of higher education student information is linear; the flat structure has fewer levels, large spans, and decentralized power. Supervision and control are relatively loose, and information is not communicated smoothly and probabilistic random matrix management is a combination of linear and flat management structures. Through the coordinated management of horizontal and vertical structural units, the information communication of each structural unit is strengthened, so that information lines in the process of work progress, fast feedback, and high efficiency in completing various businesses (Figure 7). Probabilistic random matrix management is suitable for organizations with frequent changes in work content, involving a wide range of areas, requiring multiple businesses and knowledge support, or organizations with surprise task arrangements [17]. The vertical structure of matrix management in student information management of higher education is that different levels of student information management business posts are determined by the personnel system, which is managed by the subordinate business department; the horizontal structure is to complete a certain student information management. The work task group formed by the activity, a dynamic work team centered on the activity task, is managed by the person in charge of the activity.

The security system is composed of teaching plans, course modules, course selection mechanisms, evaluation systems, and student information processing, which is a supporting element in the student information management model. It provides the operation basis, management basis, and practical guarantee for the smooth development of student information management and is the cornerstone of rationally distributing the overall teaching activities and each constituent element. The first-level security protection is dependent on the security provided by the network itself, and the network has a provision for users to use it. Security protection is to set a password in the program design module of the student information management information system and restrict the use rights of each user through the control function of the password. The institutional system is to establish a long-term working mechanism, formulate strong operational rules and regulations, clarify the corresponding functions of each department, form a relatively stable work procedure and activity framework, and realize the normal operation of the system [18]. The probabilistic random matrix student information management model accurately grasps the internal connections and basic functions of various departments and links closely related to student information management from a macrolevel, emphasize the orderliness and operability of student information management activities, and establish a complete set of student information management systems. The management system and logistics support system have formed an institutional mechanism for each performing their own duties and cooperating with each other.

5. Case Application and Its Result Analysis

5.1. Case Background and Research Design. In the process of generating the student information data to be registered, first of all, attention should be paid to the structural similarity
between the original data table and the data table to be registered. In most cases, there are many similarities in the structure of the original data table and the data table to be registered, so the probabilistic random matrix management mode can directly fill the data in the same fields of the original data table and the data table to be registered into the data table to be registered. Alternatively, in the probabilistic random matrix management mode, the same field data in the original data table as the data table to be registered can be copied out as a prototype of the data table to be registered. In the process of generating the student information data, if encountering an equal difference sequence in which the data of a certain field is increasing from top to bottom, the loop structure in the structured programming can be used [19]. The probabilistic random matrix management mode first assigns a number to the first student and then, from top to bottom, always adds data to the previous student’s number as the next student’s number until the last student. The system can automatically fill in the numbers of all students by directly executing the prewritten program of the cyclic structure without manual input. When the data of all students in many fields in the student information data table are basically the same, the system can automatically fill in the data of all students in some fields with the same value.

5.2. Result Analysis. In the matrix management mode of university student information management, vertical management is the inherent functional department system of traditional university management departments, which constitutes a stable basic organizational unit and is managed by the leadership of the management department. Horizontal management is a work task project system composed to complete a certain task. For example, in order to strengthen the service for the management of the student information of the faculties and departments, the units are divided according to the faculties and departments, and several horizontal management lines are added to form a matrix management mode. In this vertical and horizontal matrix management mode, the vertical function division system ensures the stable operation of the basic work modules, and the horizontal management chain is committed to solving practical problems such as the integration and transmission of information between the departments and the management departments and can truly reflect the service spirit of the university management department [20]. The probabilistic random matrix management mode calculates the student’s behavior sequence through the management information of the student’s student information and calculates the student’s preference sequence according to the student’s behavior sequence and student information label information and then calculates the similarity matrix about the students and the similarity matrix about the student information, and finally, the obtained student similarity matrix is integrated into the probabilistic matrix factorization model.

As shown in Figure 8(a), the probabilistic random matrix management mode realizes the horizontal integration of the information quality of the university system, the intelligence system, and the public system in the horizontal row. In the vertical row, it realizes a systematic and divisional vertical connection for all kinds of students, and at the intersection of each matrix, it is to achieve an all-round three-dimensional radiation of educational content, skills, and application levels. As shown in Figure 8(b), probabilistic random matrix management emphasizes resource sharing and cooperation, which is conducive to keeping pace, and adopts a unified strategy for the same situation, which improves the efficiency of resource utilization and forms an overall synergy. System risk mainly refers to some work risks arising from the management due to the legal but unreasonable design of the student information management system. Institutions often have guiding and restricting functions, and an unreasonable system will lead a job to deviate in an unreasonable direction, especially in systems related to graduation and degree awarding. In the absence of the review mechanism, although the student information administrators do their best to grasp every link, they are always worried or even afraid that their unintentional mistakes will lead to the
leakage of student information, which will lead to information users making wrong judgments. All the responsibilities and pressures will be borne by one person in the student information management position and this kind of pressure and responsibility needs a mechanism to protect and share it [21].

The dynamic nature of probabilistic random matrix management means that the matrix and its constituent elements, student information management, projects, and team members are all dynamically changing, and team members in the matrix can be transferred with the project in the horizontal management system or enter and exit the project. The change of the project is not determined by whether the project is completed or not, but according to the changes inside and outside the matrix. With the changes of the project, the student information management in the matrix needs to make timely and dynamic adjustments and provide all-round service support such as system guarantee and resource supply. The dynamic development of the project also has the characteristics of stability and continuity; on the premise of keeping the core and direction of the project unchanged, this model can realize the continuous development of the project [22]. The horizontal is a management system for each subbusiness targeting student service projects, whose functions highlight the specialization of student work, focus on special work research and special business guidance, and establish a project management system and system. Vertically, the school is in charge of the leadership to achieve the centralized and unified, hierarchical responsibility, and coordination and cooperation mechanism of functional departments, department leaders, and staff. Only when the horizontal and vertical work teams have clear responsibilities and close cooperation on the focus of each matrix and form a good cooperative relationship, can the effectiveness of the matrix management mode be truly exerted.

6. Conclusions

This study discussed the service and supervision functions of student information management, analyzed the incentive and guiding functions of student information management, conducted the process analysis of student information management for higher education based on probabilistic random matrix management mode, established student identity document and student status management modules, designed student scholarship, statistics, and data management modules, constructed a student information management system for higher education based on probabilistic matrix management mode, and finally carried out a case application and its result analysis. Vertically, it is a linear functional management, which is macrocontrolled by the school level, and the department is responsible for process management; horizontally, it is project management, and the project leaders are responsible for each project. The probabilistic random matrix management mode can adopt a multilevel, multichannel, and multiform continuing education method according to the different knowledge levels and professional characteristics of the student management personnel, combining theoretical training with practical training, domestic training and overseas training, short-term training, and vocational education. The study results show that the probabilistic random matrix management mode is a combination of linear and flat organizational structures and has the advantages of short information lines, fast information feedback, and high operation efficiency; it can input the matrix form of prior data and use statistical probability knowledge to derive the

Figure 8: Relationship between management efficiency and matrix probability in the service and supervision and incentive and guiding functions of student information management with probabilistic matrix factorization algorithm (a) and random matrix factorization model (b).
probability density function of posterior feature vector and predict the recommendation result through feature vector. The probabilistic random matrix management mode first calculates student’s behavior sequence through their management information and then calculates the student’s preference sequence according to their behavior sequence and label information and subsequently calculates the similarity matrices about the students and their information and finally integrates the obtained student similarity matrix into the probabilistic matrix factorization model.

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

Conflicts of Interest
The author declares that there are no conflicts of interest or personal relationships that could have appeared to influence the work reported in this paper.

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