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A quantitative assessment of the relationship between college management and college students' employability enhancement

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ABSTRACT
There is a close quantitative relationship between college management and college students' employability. This paper adopts Adaboost integration algorithm to construct an employment management system that integrates graduates' personalized recommendation. And it divides graduates according to their personal situation and analyzes the relationship between their personal ability and employment recommendation. In addition, the relationship between the management based on the system of this paper and the employment ability of graduates in colleges and universities is quantitatively analyzed by logistic regression model. A questionnaire survey is taken to assess the changes in graduates' employability as a result of the employment management activities organized by colleges and universities. The recommendation system constructed in this paper has a higher accuracy rate of 6.92% and 16.32% than the comparison system 1 and 2 respectively when the number of job recommendations is 60. And its recall rate and F1 value are also consistently higher than the comparison system. In this paper, the system divides the sampled 200 graduates into 5 categories to provide more accurate employment recommendation for graduates of different categories. The results of regression analysis show that universities organize employment management activities can improve the employability of graduates. For example, for every unit of "Interview practice", the employability of graduates increases by 0.349. The results of the questionnaire survey show that the employability of graduates, both individually and as a whole, improves to different degrees after participating in the management activities organized by colleges and universities. In conclusion, the construction of employment management system in universities and the organization of employment management activities can improve the quality and ability of graduates' employment.

Keywords: college management, Adaboost integration algorithm, personalized recommendation, clustering method, logistic regression model

1. Introduction

Successful employment is the basic goal of college students' education, and the employment status of

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students reflects the degree of adaptation between the talent cultivation of colleges and universities and the demand of social talents on the one hand, and the sustainability of college education on the other hand [1-2]. In recent years, due to the international economic situation is not stable enough, coupled with the domestic economy is in transition, the market competition is becoming more and more intense, the demand for jobs is also shrinking, college students' employment problem has become more and more serious, many college students are faced with the embarrassing situation of graduation is unemployment [3-5]. From the current situation of university education, each university will carry out employment guidance work for students who are close to graduation, but due to the differences in the quality of education and management focus among universities, the effect of their employment guidance work varies [6-7]. Some colleges and universities have more favorable policy support, enterprise support and good enterprise background, which is conducive to systematic employment training for students [8]. In this context, colleges and universities need to improve students' professional knowledge and cultivate their entrepreneurial and employment ability, in order to promote them to be able to face the increasingly fierce competition [9-10]. To this end, colleges and universities need to continuously innovate the employment and management system to provide scientific guidance for students' employment. Then how to deal with the difficult employment problem of college students has become a problem that must be solved by colleges and universities [11-13].

As society continues to progress and higher education grows at a rapid pace, management in higher education faces increasing challenges. Literature [14] emphasizes the importance of management by delving into three key areas of leadership - culture, structure and public responsibility - and drawing on areas outside of education to innovate approaches to the overall educational management experience. Literature [15] examines the implementation of educational management standards in a number of ways, using a private Islamic high school as an example, pointing out that the challenges it faces are mainly in the areas of student interest, quality of service, efficiency of financial planning, and policy support, and proposing relevant improvements. Literature [16] aims to fill the gap in educational management by encouraging schools to develop their own management skills by thinking critically about information on educational policy making, policy implementation and effective day-to-day operations.

With the increase in the number of university graduates, the employment situation has become more and more severe, and the employment problem of university students has attracted widespread attention from the society. Literature [17] used cases from 21 developing and developed countries as data sources to examine the relationship between higher education and employment in terms of demand for higher education, organization and access, quantitative development, system operation and other aspects. Literature [18] selected 300 university graduates from different public and private universities as experimental subjects to investigate the factors affecting the employment of university students and found that self-discipline, an employability skill, is very important and there is a significant association between employability skills of graduates and gender. Literature [19] analyzed the relationship between university entrepreneurship education and students' entrepreneurial intentions through descriptive statistics, Pearson product moment correlation coefficient, t-test and ANOVA, and the results showed that students' entrepreneurial intentions are affected by entrepreneurship education.

The enhancement of employability is the prerequisite for the successful employment of college students, and the cultivation work carried out by colleges and universities for the employability of college students is the key to the enhancement of employability. Literature [20] set industry-academia collaboration as a mediator variable, based on the model of the European Foundation for Quality Management to study the relationship between quality management system of colleges and universities and graduates' employability, and the results show that the development of quality management of colleges and universities can, to a certain extent, promote the enhancement of the management of students' employability. Literature [21] provides insights into the definition of

graduate employability from four perspectives: higher education institutions, students, government and employers, as well as exploring how to achieve and improve student employability, and the study provides a theoretical basis for career-oriented higher education research. Literature [22] pointed out the importance of graduates' mastery of professional skills and employability skills, and attempted to offer a specialized employability skills module in the final year of undergraduate courses, and verified the feasibility of this module through empirical analysis, which can significantly enhance students' employability.

With the rapid development of globalization and knowledge-based economy, higher education plays an increasingly important role in talent cultivation and social development. How to improve the employment ability of college students has become an urgent problem for colleges and universities. Taking this as a starting point, this paper constructs an employment management system for colleges and universities, which provides graduates with matching employment positions through Adaboost integration algorithm and cluster analysis method. And the recommendation algorithm used in this paper is compared with user-based collaborative filtering recommendation algorithm and item-based collaborative filtering recommendation algorithm to further prove the feasibility of this paper's algorithm in the employment management of colleges and universities. Finally, through Logistic regression model and questionnaire survey, we evaluate whether the management activities of colleges and universities have a positive effect on the improvement of graduates' employability.

2. Methodology

2.1. Theory of cluster analysis

2.1.1. Data processing for clustering elements. In a system, if there are m clustering objects in it, then each clustering object is composed of multiple elements, which eventually form a system composed of different elements. Generally speaking, there are differences in the clustering objects of the system, including the scale, unit and corresponding range, etc., which need to be considered separately. In order to compare and analyze the results of these different clusters, it is necessary to process the data of these clusters in order to achieve the purpose of analysis. When analyzing the clustered objects, the following methods are commonly used:

1) Sum standardization

$$x_{ij}^{'} = \frac{x_{ij}}{\sum_{i=1}^{m} x_{ij}} (i = 1, 2, \cdots, m, j = 1, 2, \cdots n) \tag{1}$$

And:

$$\sum_{i=1}^{m} x_{ij}^{'} = 1 (j = 1, 2, \cdots n) \tag{2}$$

2) Standard deviation standardization

$$x_{ij}^{'} = \frac{x_{ij} - \overline{x_j}}{s_j} (i = 1, 2, \cdots, m, j = 1, 2, \cdots, n) \tag{3}$$

where the mean is $\overline{x_j} = \frac{1}{m}\sum_{i=1}^{m} x_{ij}^{'}$, the mean squared deviation is $s_j = \sqrt{\frac{1}{m}\sum_{i=1}^{m}(x_{ij}^{'} - \overline{x_j^{'}})^2}$, and the mean squared deviation satisfies the following normalized relationship.

$$s_j = \sqrt{\frac{1}{m}\sum_{i=1}^{m}(x_{ij}^{'} - \overline{x_j^{'}})^2} = 1 \tag{4}$$

With the above formulas (3) and (4), the sample mean of any variable is 0, the extreme deviation is l, and $\left|x_{ij}^{*}\right|<1$. Large errors can be avoided in subsequent studies; and the processed data are dimensionless.

3) Maximum value standardization

$$x_{ij}^{'}=\frac{x_{ij}}{\max_i\{x_{ij}\}}(i=1,2,\cdots,m,j=1,2,\cdots,n) \tag{5}$$

The new data obtained after this standardization has a great value of 1 for each element and less than 1 for the rest of the values.

4) Polar deviation standardization

$$x_{ij}=\frac{x_{ij}-\min_i\left\{x_{ij}\right\}}{\max_i\left\{x_{ij}\right\}-\min_i\left\{x_{ij}\right\}}\left(i=1,2,\cdots m,j=1,2,\cdots,n\right) \tag{6}$$

The brand-new data obtained through the standardization of the extreme deviation, the different elements of the extreme values are all 1, while the minimal values are all 0, and the remaining values have a strict range restriction, which are all within the range of 0-1.

2.1.2. Calculation of inter-sample distances and similarity coefficients：

1) Distance calculation. The distance that exists between different samples is often used as an indication of the degree of closeness to each other and is a commonly used metric. Let the data be $x_{xj}(i=1,2,\ldots,n;j=1,\ldots,m)$, then it can be listed as the following equation.

There are n samples, each sample measured P variables, the original data array is

$$X=\begin{bmatrix}x_{11} & x_{12} & \cdots & x_{1p}\\ x_{21} & x_{22} & \cdots & x_{2p}\\ \vdots & \vdots & & \vdots\\ x_{n1} & x_{n2} & \cdots & x_{np}\end{bmatrix} \tag{7}$$

where x_{ij} is the observation of the j rd variable for i samples.

The distance between samples i and j is d_{ij} and smaller values indicate that the two samples are more similar.

The Euclidean distance d_{ij} is calculated by the formula (8)

$$d_{ij}(2)=\left(\sum_{k=1}^{p}|X_{ik}-X_{jk}|^2\right)^{1/2} \tag{8}$$

2) Similarity coefficient. Cosine of angle

The cosine of the angle between variables X_i and X_j can be expressed as

$$\cos\theta_{ij}=\frac{\sum_{k=1}^{p}X_{ik}X_{jk}}{\sqrt{(\sum_{k=1}^{p}X_{ik}^2)(\sum_{k=1}^{p}X_{jk}^2)}} \tag{9}$$

Correlation Coefficient The degree of similarity between any variables is usually represented by the correlation coefficient. The correlation coefficient between variables X_i and X_j is defined as

$$r_{ij}=\frac{\sum_{k=1}^{p}(X_{ik}-\overline{X_i})(X_{jk}-\overline{X_j})}{\sqrt{\sum_{k=1}^{p}(X_{ik}-\overline{X_i})^2(X_{jk}-\overline{X_j})^2}} \tag{10}$$

Currently, distance is often used to deal with sample classification problems, while variable classification problems are dealt with by two-similarity coefficients, which are commonly used distance for type Q cluster analysis and commonly used similarity coefficients for type R cluster analysis, which are obtained through the analysis and summarization of long-term applications.

2.2. Adaboost integration algorithm

Adaboost algorithm is a kind of boost integration algorithm, it is an algorithm that gradually improves the trainer, which can improve many weak classifiers one by one, and finally combine them to become a strong classifier [23-24]. In Adaboost algorithm the weights of the samples which are wrongly classified by the previous weak classifiers will be strengthened and the data records after updating the weights will be used to train the next weak classifier. In turn, the weights of the samples and the voice of the new weak classifier are updated and iterated until a predetermined error tolerance or a specified number of iterations is reached.The principle and steps of Adaboost are as follows:

1) Initialize the weight distribution of the data in the training set: if there is N data record, the weight at the beginning of each data record is $\frac{1}{N}$. This is shown in equation (11):

$$D_1=(w_{11},w_{12},\cdots w_{1i}\cdots,w_{1N}),w_{1i}=\frac{1}{N},i=1,2,\cdots,N \tag{11}$$

Where, D_1 represents the weight of each sample during the first iteration. The weight of the first sample during the first iteration is represented using w_{11} and the total number of samples is N.

2) The weak classifier is trained, during which if a data record has been accurately categorized, the weight of this data record is lowered in the next training set construction; on the contrary, if the data record fails to be accurately categorized, the weight is raised. In the meantime, the weak classifiers are given the corresponding words. The data record whose weights have been updated will be used to train the next classifier and then iterated continuously. The weak classifier is obtained by training the training set of $D_m(m=1,2,3\cdots N)$ with weights classification as shown in equation (12):

$$G_m(x):\chi\to\{-1,+1\} \tag{12}$$

Where the weak classifier at the m th iteration will classify the data as -1 or 1 to get the error function minimizing weak classifier as shown in equation (13):

$$\varepsilon_{\mathrm{m}}=\sum_{n=1}^{N}w_n^{(m)}I(y_m(x_n)\neq t_n) \tag{13}$$

For the weak classifier $G_m(x)$ discourse power, α_m denotes that the discourse power represents the importance of $G_m(x)$ in the final classifier. e_m is the ε_m in Eq. (13). α_m expression is shown in Eq. (14):

$$\alpha_m=\frac{1}{2}\log\frac{1-e_m}{e_m} \tag{14}$$

It can be seen that α_m increases as the error function e_m decreases, i.e., the smaller the error margin of the classifier, the more important it will eventually be in the trained strong classifier. The expressions for D_{m+1} and $w_{m+1,l}$ are shown in equations (15) and (16):

$$D_{m+1} = (w_{m+1,1}, w_{m+1,2} \cdots w_{m+1,i} \cdots, w_{m+1,N}), \tag{15}$$

$$w_{m+1,j} = \frac{W_{mi}}{Z_m} \exp(-\alpha_m y_i G_m(x_i)), i = 1, 2, \cdots, N \tag{16}$$

$D_{m+1}, w_{m+1,j}$ represents the weights of the sample and the weights of the i nd data record, respectively. In equation (16), y_i represents the category corresponding to the i th data record, and $G_m(x_i)$ represents the classification of data record x_i by the weak classifier. If the classification is correct, $y_i \cdot G_m(x_i)$ is 1, and vice versa -1. Z_m is the normalization factor that makes the sum of the corresponding weights of all data records 1.

All the weak classifiers obtained from training are combined to become strong classifiers, which are continuously iterated through the steps of (2). After the iteration is completed, the final strong classifier is obtained as shown in equation (17):

$$f(x) = \sum_{m=1}^{M} \alpha_m G_m(x) \tag{17}$$

It is necessary to add another sign function for finding the value positive or negative. As shown in equation (18):

$$G(x) = sign(f(x)) = sign(\sum_{m=1}^{M} \alpha_m G_m(x)) \tag{18}$$

2.3. Design and realization of the employment management system

2.3.1. System design options. Figure 1 shows the system framework diagram of this paper. The background of the graduate information management and recommendation system mainly includes the database of past graduates, the database of graduates and encapsulates the clustering algorithm, Adaboost integration algorithm, similarity algorithm based on empirical formulas, as well as the search and query of the database data, data entry and other functional modules. The system uses Adaboost integration algorithm to recommend the matching graduation direction to the user, and it can recommend the information of a class of former graduates similar to the user and the corresponding graduation direction information through the clustering module based on the information given by the user. In addition, in the category display page, the user can view the past graduates under the corresponding category according to the graduation direction, or search the database for past graduates based on keywords for reference.

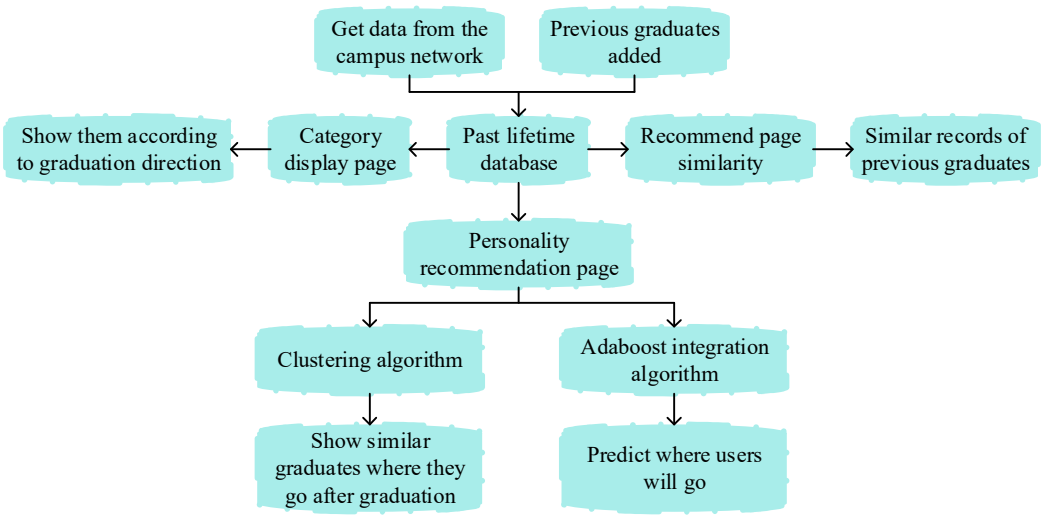

Fig. 1. System architecture

There are two main functions realized by this system: one is to manage the data of past graduates, and the other is to recommend valuable information about graduation destinations to users. For the management of past graduates' data, the system uses a categorized page for querying. Users can query the information they are interested in according to the categorization of graduation destination or query the data in the database of past graduates according to keywords. For the recommendation of graduation information, the system gives three algorithms to recommend information to the user, as follows:

(1) Similarity calculation algorithm [25] recommends information about past graduates with the highest similarity to the user;

(2) Adaboost integration algorithm predicts the suitable graduation destination for the user;

(3) The clustering algorithm [26] produces the personal information and graduation destination of a class of former graduates with the highest degree of similarity to the user.

The system uses two integrated pages to display the recommendation results of the three recommendation algorithms. The user will first go to the login/registration page to login or register, after entering the system the user can check the details of the previous students according to the category of graduation destination. Users with the status of graduates can click on the User Information Input button to enter their personal information, which is saved in the database. You can click on the Similar Recommendations button, which will jump to the page requesting the user to enter information, and after the user enters the relevant information, the user will be able to jump to a page displaying the most similar data of past graduates for the user. You can click on the personalized recommendation button, will jump to the request for user input information page after the user enters the relevant information to achieve the jump to the information recommendation page. The page will display the information recommended by the system for the user according to the algorithm described in the previous section, and the user operation flow chart is shown in Figure 2.

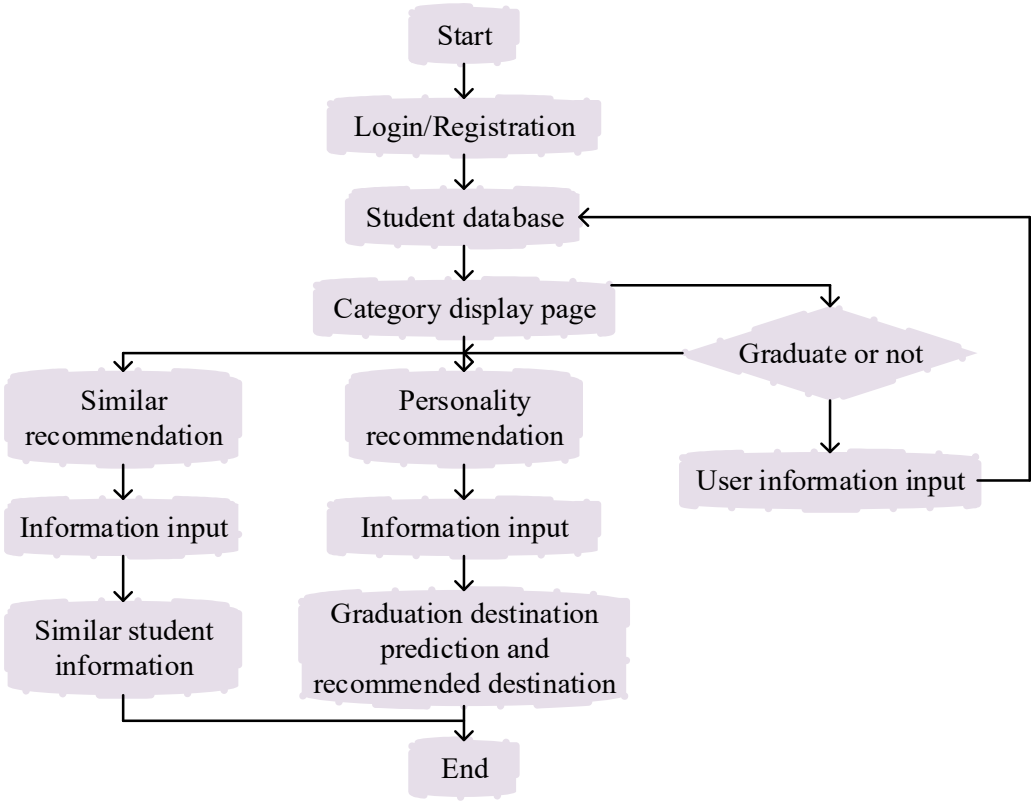

Fig. 2. User operation flowchart

2.3.2. System Hierarchy Design. The hierarchical architecture diagram is shown in Figure 3. Layered architecture splits the complex software system, analyzes the corresponding technology of the split system, solves the problems one by one, reduces the difficulty of work, and improves the reusability of the code. Layered architecture always follows the principle of "high cohesion, low coupling", decomposing large functional modules into multiple small functional modules, and then designing small functional modules according to the design ideas, and finally combining small functional modules. Layering technology is versatile, does not have too high requirements on the level and structure of management systems, can be applied in different types of management systems, and is highly operational, but also can optimize the software structure. In addition, there is no too high technical requirements for software developers, software personnel only need to complete their own work tasks, without worrying about the degree of cooperation of the software system.

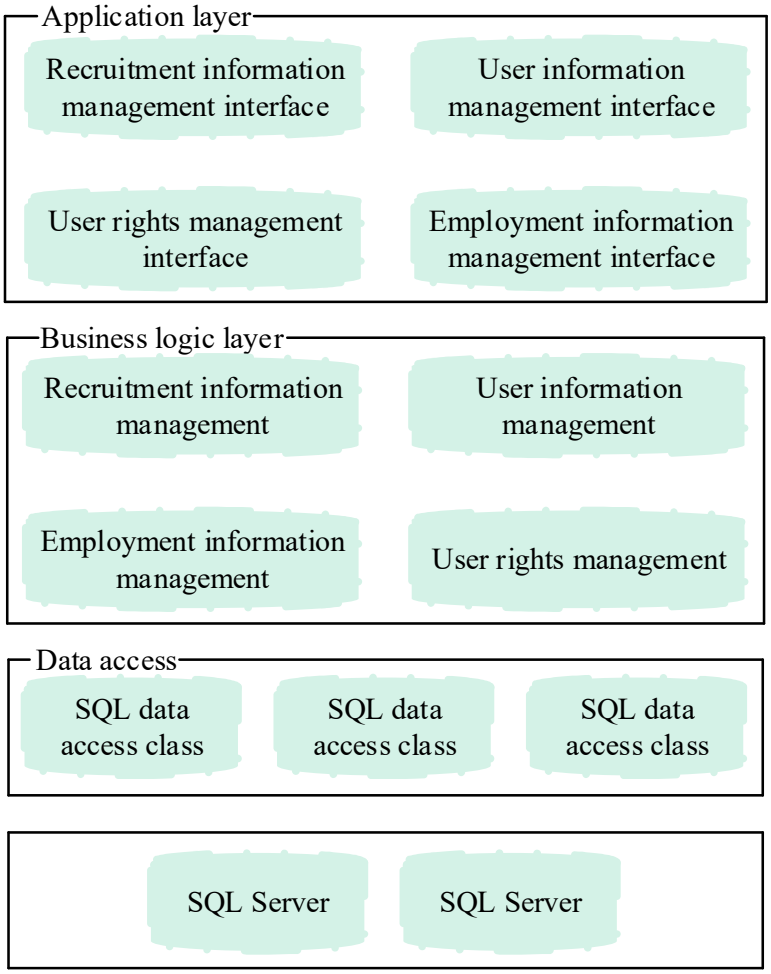

Fig. 3. Schematic diagram of layered architecture

2.3.3. System Functional Module Design. Graduate employment information management system consists of several modules. The functional module diagram of the system designed in this paper based on the algorithmic model is shown in Figure 4.

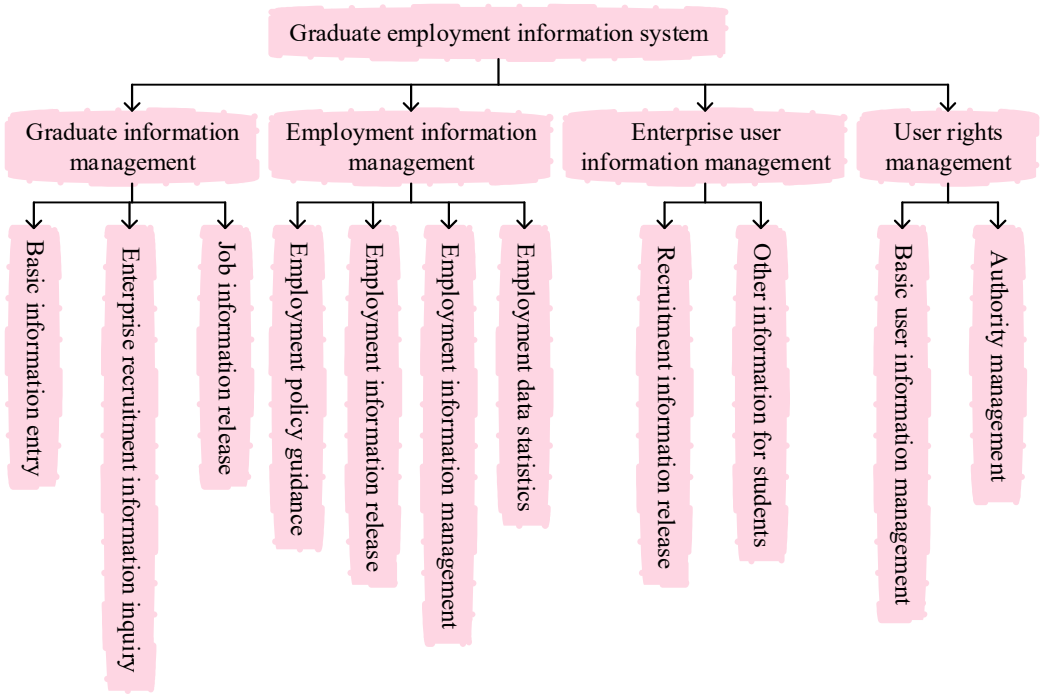

Fig. 4. System function module diagram

1) Graduate Information Management. Graduate information management is mainly a systematic management mode for the basic information of graduates. Graduates can log in at any time according to the actual situation to make certain improvements and modifications to their information, and search for relevant recruitment information in the system.
2) Employment Information Management. Employment information management refers to the review and approval of recruitment information uploaded by recruiters and the uploading and management of other recruitment information, checking all kinds of employment information, employment guidance, employment policy and statistics of employment data.
3) Enterprise User Information Management. Enterprise user information management is to manage the basic information of recruiters. Enterprises mainly carry out two operations in the system, one is to publish relevant recruitment information, and the other is to browse the personal information of students who submit resumes. By viewing students' resumes, they can invite students for interviews.
4) User rights management. User rights management includes basic user information management and user rights management. It is to manage the basic information of all kinds of system users and limit their power accordingly. In this system, the system administrator manages the whole system, not only for the review of various information, but also for different users to give different rights.

2.4. System-based student management in higher education institutions

2.4.1. Employability of interventions in higher education management activities. For the improvement of the employability of graduates of a university as well as combining the needs of graduates for adjusting the perception of employment anxiety, mastering employment skills, building confidence, and alleviating employment anxiety, this paper designs five employment activities based on the referral system, which are interlocked and progressive from understanding employment to learning employment skills to consolidating and rehearsing the skills of employment knowledge, to build up the confidence in employment, alleviate the employment anxiety, and successfully realize employment. Finally, the impact of university employment management activities on graduates' employability is assessed by means of questionnaires. The specific plan of employment management activities is shown in Table 1 below.

Table 1. University management activities schedule

Activity name	Active target	Activity content	Duration
Learning about employment	Expanding employment knowledge and further understand the professional environment.	Asking the teacher to explain the way of obtaining employment information and relevant professional information for graduates	2h
Relieve employment pressure	Relieving the employment pressure of graduates. Improve job confidence.	In the way of games and video to promote team members to review their professional internship and achievements	3h
Familiar with applying skills	Resume making and interview skills training.	Invite experts to teach job interviewing skills and invite teachers to teach how to make a good resume	2h
Interview practice	Improve the ability of team members and understand the requirements of enterprise recruitment.	Organize graduates to visit alumni where they are, and conduct offline interview exercises.	3h
Shared practices	Review, consolidate the results of learning, summarize the learning experience, and evaluate the ability of employment	Invite graduates to share activities and fill out the employment ability survey questionnaire.	2h

2.4.2. Quantitative relationship analysis methods：

1) Logistic model characteristics. Logistic models are widely used in different fields due to the fact that they do not have overly harsh assumptions compared to linear equations [27]. In order to avoid the negative consequences of covariance, it is necessary to first implement correlation processing on the data. The standard deviation of the processed data is affected by the degree of correlation between the indicators, the correlation degree increases, the standard deviation will produce correlation changes, if the indicators are too correlated, it will lead to an increase in the error; in addition, there is a certain lack of model generalization ability, there are many factors affecting the model, the number of samples

and the number of samples of the final statistics, all of which will have an impact on the model.
2) Applicability analysis. Logistic regression was mainly used in the medical field in the beginning, and then began to be applied to the economic field. In the enterprise, managers tend to realize the prediction of whether the enterprise has a financial crisis through intuitive data, Logistic model just meets this requirement, which can directly transform the possibility of the enterprise's financial crisis into a probability problem. Therefore, it is necessary to process the data through normality test and independent sample test for subsequent research.

In this paper, the relationship between school management and graduates' employability is qualitatively analyzed using Logistic model.

3. Results and analysis

3.1. Results of cluster analysis based on individual circumstances

The data used in this study come from the College Employment Network and the employment referral platform designed in this paper, with selected graduate employment data from a total of 20 colleges and universities for the past five years. The types of schools cover comprehensive universities, universities of science and technology, and universities of finance and economics. The original data contains 15,671 pieces of data, removing incomplete and obviously distorted information, leaving 13,573 pieces of data, containing graduate employment data for multiple majors in 13 academic disciplines. Among the valid samples, specialists account for about 2.3%, undergraduates account for about 69.6%, masters account for about 26.6%, and doctoral students account for about 1.5%; by gender, except for the data with missing gender information, men and women account for 47.23% and 52.77%, respectively; and it contains 762 economically disadvantaged students from families.

In this paper, 200 graduates are randomly selected to carry out questionnaire survey statistics and cluster analysis of graduates' employment choices with graduates' professional ability, social practice ability, English level and computer level as the basis of clustering. So that the employment recommendation system in this paper can provide accurate and reliable employment recommendations for graduates of different groups.

The results of the cluster analysis based on the information of graduates are shown in Figure 5. In this paper, the system divides the above graduates into five clusters. The characteristics of graduates in different clusters are shown in Table 2. Take the purple group in the figure as an example, the graduates in this group have excellent professional ability and social practice ability, as well as high English and computer proficiency at the same time. In this paper, the recommendation system will prioritize the graduates in this group to recommend jobs that meet their personal abilities, such as software development engineers, international sales representatives, and so on. As for the blue group, these graduates do not have a deep grasp of English and computers, but have basic professional skills and strong communication skills. In this article, the recommendation system will give priority to recommending jobs that do not have rigid requirements for English or computers, such as product sales, customer service representatives and so on.

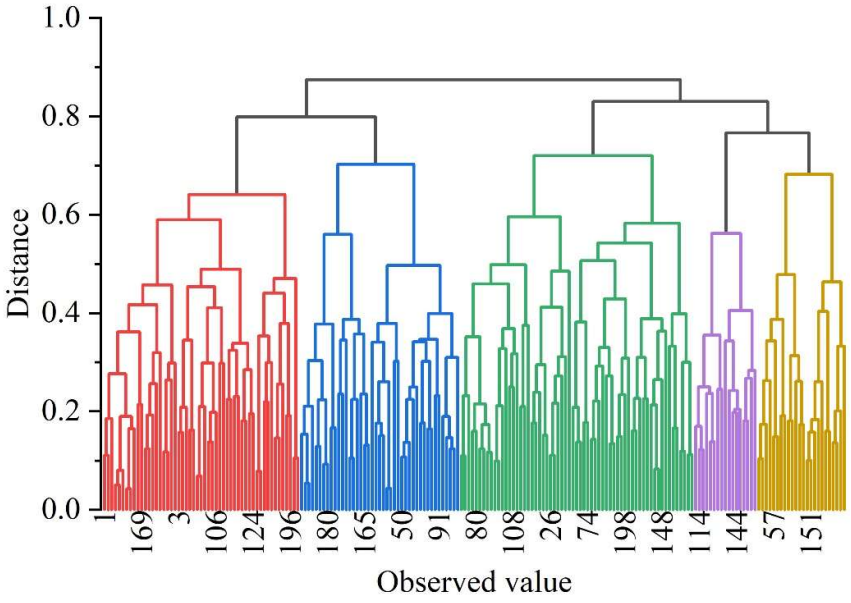

Fig. 5. Graduate employment cluster diagram

Table 2. Characteristics of different clustering graduates

Clustering	Detailed description
Purple	Professional and social practice ability is strong, and have high English level and computer level. And good at teamwork and communication.
Yellow	Strong ability of professional and social practice, and have high English level or computer level.
Blue	Strong ability and social practice, and have general English level and computer level, with good communication skills.
Red	Having certain professional and social practice ability, and have general English level and computer level
Green	With certain professional and social practice ability, English and computer are not very good at

3.2. Comparison of Recommended System Performance Tests

In this paper, the used recommendation algorithm is compared and experimented with the user-based collaborative filtering recommendation algorithm (notation system 1) and the item-based collaborative filtering recommendation algorithm (notation system 2), and the list of recommended posts is set to different lengths, and the accuracy rate, recall rate, and F1 value are calculated respectively.

Figure 6 demonstrates the accuracy comparison results of different recommender systems. From the figure, it can be grasped that with the increase of the number of recommended posts, the accuracy rate of each recommender system has an obvious decreasing trend. But, the accuracy rate of the system in this paper is higher than the other two systems from beginning to end. And, when the number of job recommendations is 60, the system in this paper improves 6.92% and 16.32% compared with system 1 and 2 respectively.

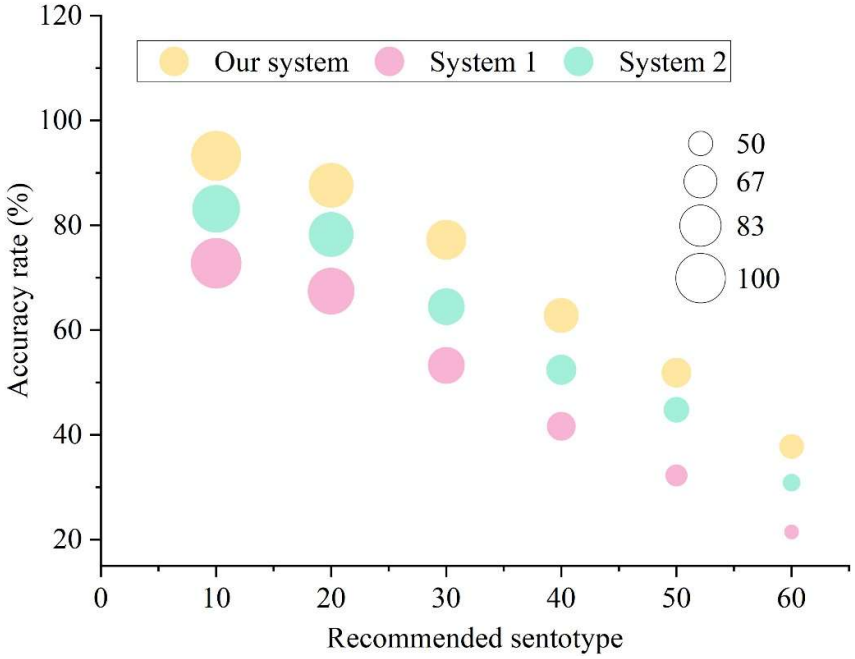

Fig. 6. Comparison of accuracy of different system

The results of the comparison of recall rates and F1 values of different recommender systems are shown in Fig. 7. As far as the recall rate is concerned, each recommender system shows a small increase with the increase in the number of recommended positions. When the number of recommended positions is 60, the recall rate of this paper's algorithm is 0.91, much higher than that of system 1's 0.77 and system 2's 0.79. In terms of the F1 value, the three recommender systems show a tendency of increasing and then decreasing with the increase in the number of recommended positions. However, the F1 value curve of the system in this paper has been located above the other two sets of curves.

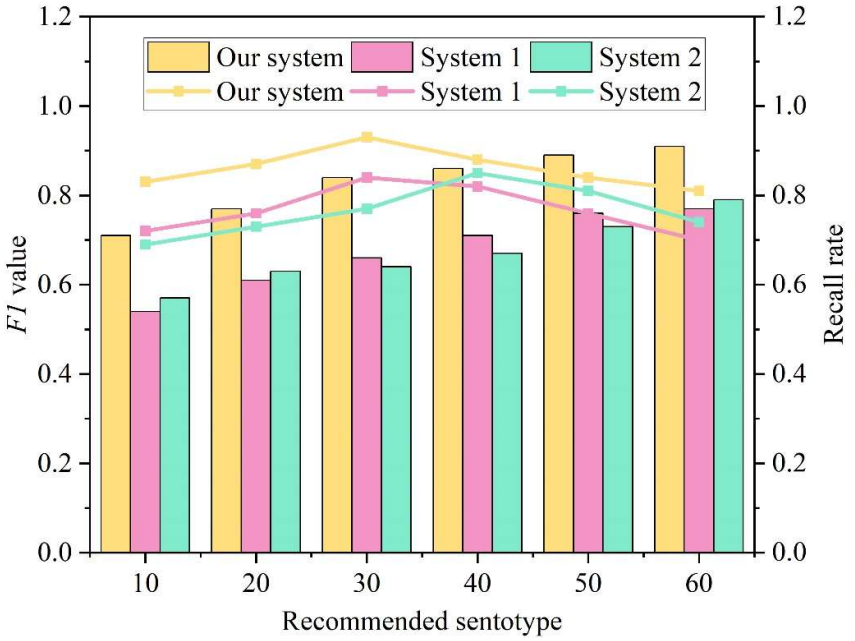

Fig. 7. Comparison of Recall rate and F1 value of different system

Overall the recommended system algorithm proposed in this paper has higher accuracy, recall, and

F1 value than the user-based collaborative filtering recommendation algorithm and the item-based collaborative filtering recommendation algorithm, indicating that the recommended system proposed in this paper can improve the quality of the recommendation results.

3.3. Changes in employability with the intervention of higher education management activities

In this study, a total of five management activities carried out by school organizations were counted. In order to better meet the needs of the graduates and to achieve the objectives of the activities, the school organizations adjusted the activity programs in a timely manner according to the actual feelings of the graduates in order to achieve a better effect of the activities.

At the beginning and end of the management activities, in order to examine the graduates' employability and assess the effectiveness of the participation in the activities, 5 graduates (marked with the number 1-5) were invited to fill out the Questionnaire for Measuring the Employability of College Students, and to assess the effectiveness of the management activities' interventions by evaluating the competency scores through the graduates' participation in the activities before and after the activities, and judging the effectiveness of the interventions.

The difference of each employability score for the 5 graduates before and after the activity is shown in Figure 8. As can be seen in Figure 8, for the five graduates, after participating in the management activity, their various employability competencies improved to different degrees. For example, graduate No. 2, after participating in the management activity, his professional knowledge, cooperation ability, and time ability increased by 4 points, communication ability increased by 5 points, and job application ability increased by 6 points, which is a significant improvement in each ability.

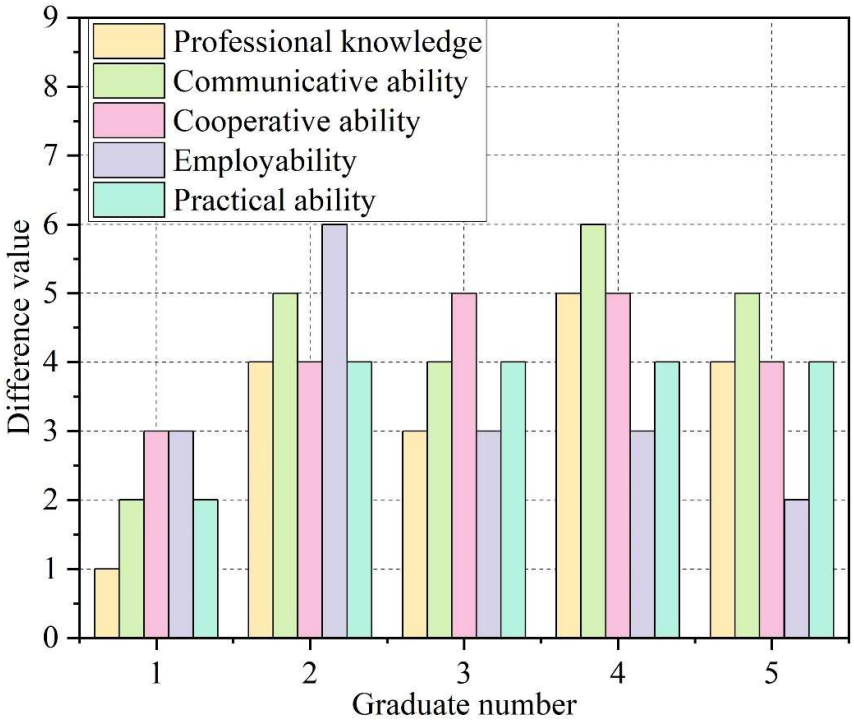

Fig. 8. The difference in employment capacity scores

In addition, this paper compares the mean scores of all graduates for each competency before and after the event. The average scores of each employability ability before and after the activity are shown in Table 3. Where P K, C A, Co A, E A, P A correspond to professional knowledge, communication ability, cooperation ability, job application ability as well as practical ability respectively. As shown in Table 3, before participating in the activity, the graduates' practical ability and application ability were weak,

especially the practical ability, with an average score of 10.7. After participating in the management activity, the graduates' average scores of each employability ability increased greatly, especially the cooperation ability, which increased by 3.9 compared with that before the activity.

Table 3. The average score of the ability before and after the activity

Employment capacity	P K	C A	Co A	E A	P A
Preactivity	14.5	12.7	12.3	11.1	10.7
After activity	16.4	15.4	16.2	14.5	13.6
Increase value	1.9	2.7	3.9	3.4	2.9

In conclusion, it can be concluded that the management activities organized in universities and colleges have a significant increase in the employability of graduates, which can be used by universities and colleges to increase the employment rate of graduates.

3.4. Qualitative analysis of university management on employability enhancement

This paper conducts a regression analysis to explore the relationship between university management and graduate employability. In this study, Gender, Age, Majors, English level, and Computer level were used as control variables. "The use of our system" as an intermediate variable. The management activities organized by universities are independent variables, including "Learning about employment", "Relieve employment pressure", "Familiar with applying skills", "Interview practice" and "Shared practices". The results of the regression analysis of the impact of university management on employability are shown in Table 4.

As can be seen from Table 4, Model 1, which includes control variables first in the regression equation, shows that graduates' Gender, Majors, English level, and Computer level have a significant effect on graduates' employability. For example, when graduates' English level and Computer level increase by 1 unit, their employability responds to increase by 0.267 and 0.179 respectively.The R^2 level of model 1 is 0.261, which means that the control variable explains 26.1% of the reasons for the change of the dependent variable. Model 2 shows the results of the effect of adding the independent variables on the employability of graduates. It can be seen that after including the management activities of university organizations in the regression analysis, all five management activities have a significant positive impact on the employability of graduates, among which, for every one unit increase in “Interview practice”, the employability of graduates increases by 0.349, which is the biggest impact among all activities. The R^2 level of model 2 is 0.306, which means that 30.6% of the change in graduates' employability is caused by graduates' participation in school management activities. Model 3 shows the effect of adding this paper's system on the employability of graduates. For every unit of improvement in the graduates' use of the system of this paper, their employability increases by 0.274. The use of the system in this paper has likewise had a significant effect on the employability of graduates.

Table 4. College management affects the return analysis of employment ability

Variable		Employment capacity (dependent variable)		
		Model 1	Model 2	Model 3
Control variable	Gender	0.153***	0.131***	0.127***
	Age	0.024	0.017	0.020
	Majors	0.241***	0.185***	0.237***
	English level	0.267***	0.241***	0.205***
	Computer level	0.179***	0.193***	0.163***
Regulating variable	The use of our system			0.274***
Independent variable	Learning about employment		0.203***	
	Relieve employment pressure		0.264***	
	Familiar with applying skills		0.311***	
	Interview practice		0.349***	
	Shared practices		0.193***	
R^2		0.261	0.306	0.245
Adjusted R^2		0.143	0.213	0.196
F		17.641***	29.418***	34.418***

*p<0.05,**p<0.01,***p<0.001

4. Conclusion

College graduates are the most important group in the labor market, and the management of colleges and universities is significantly related to the employability of graduates. In this paper, based on the Adaboost integration algorithm, we constructed a college employment management system, and this system can make personalized job recommendations to graduates according to their individual situations.

1) The accuracy of the recommendation system in this paper is higher than the two comparison systems. Take the number of job recommendations equal to 60 as an example. The accuracy rate of this paper's recommendation system is 6.92% and 16.32% higher than system 1 and 2 respectively. In addition, the recall of this paper's system is 0.91, which is much higher than the comparison systems. And the F1 value of this paper's system, too, is always higher than the comparison system.

2) This paper divides the extracted 200 graduates into 5 classes by cluster analysis. And using the recommendation system of this paper, personalized job recommendations are made for graduates of different classes and groups for their employment choices as a reference. The school provides accurate and reliable employment positions through the employment recommendation system, so as to improve the employment quality of graduates.

3) The results of regression analysis show that all five employment management activities can significantly improve the employability of graduates. Among them, “Interview practice” has the most obvious effect, for every unit of improvement, the employability of graduates increases by 0.349. In addition, the system of this paper can also improve the employability of graduates. For every one unit of improvement, the employability of graduates will increase by 0.274.

4) This paper uses a questionnaire to assess the employability of graduates of a school, before and after participating in management activities. For graduate #2, there is a significant increase in all employability abilities after participating in the activity, especially in job application ability, which

increased by 6 points. In addition, the average scores of all graduates for each employability competency also increased significantly, with the cooperation competency showing the greatest change, with an increase of 3.9 points from the pre-event level.

References

[1] Mohammed, A. A., Hafeez-Baig, A., & Gururajan, R. (2018). Talent management as a core source of innovation and social development in higher education. Innovations in Higher Education-Cases on Transforming and Advancing Practice, 1-31.

[2] Brown, P., Sadik, S., & Xu, J. (2021). Higher education, graduate talent and the prospects for social mobility in China's innovation nation. International Journal of Educational Research, 109, 101841.

[3] Rashid, M. H., & Islam, M. A. (2020). Impacts of unemployment on graduates in Bangladesh: a case study. Br. J. Arts Humanit, 2(5), 87-94.

[4] Ren, W. (2021, February). A study on college graduates' employment problem in the context of big data based on the event of COVID-19. In Proceedings of the 2021 4th International Conference on Big Data and Education (pp. 88-91).

[5] Graham, L., Williams, L., & Chisoro, C. (2019). Barriers to the labour market for unemployed graduates in South Africa. Journal of Education and Work, 32(4), 360-376.

[6] Pordelan, N., & Hosseinian, S. (2022). Design and development of the online career counselling: a tool for better career decision-making. Behaviour & Information Technology, 41(1), 118-138.

[7] Okolie, U. C., Nwajiuba, C. A., Binuomote, M. O., Ehiobuche, C., Igu, N. C. N., & Ajoke, O. S. (2020). Career training with mentoring programs in higher education: facilitating career development and employability of graduates. Education+ Training, 62(3), 214-234.

[8] Schmid[1], G. (2017). Transitional Labour Markets A New European Employment Strategy. Innovative Employment Initiatives, 223.

[9] Laguna-Sánchez, P., Abad, P., de la Fuente-Cabrero, C., & Calero, R. (2020). A university training programme for acquiring entrepreneurial and transversal employability skills, a students' assessment. Sustainability, 12(3), 796.

[10] Pardo-Garcia, C., & Barac, M. (2020). Promoting employability in higher education: A case study on boosting entrepreneurship skills. Sustainability, 12(10), 4004.

[11] Jackson, D., & Tomlinson, M. (2020). Investigating the relationship between career planning, proactivity and employability perceptions among higher education students in uncertain labour market conditions. Higher education, 80(3), 435-455.

[12] Römgens, I., Scoupe, R., & Beausaert, S. (2020). Unraveling the concept of employability, bringing together research on employability in higher education and the workplace. Studies in Higher Education, 45(12), 2588-2603.

[13] Suleman, F. (2018). The employability skills of higher education graduates: insights into conceptual frameworks and methodological options. Higher Education, 76, 263-278.

[14] Beare, H., Caldwell, B. J., & Millikan, R. H. (2018). Creating an excellent school: Some new management techniques. Routledge.

[15] Anwar, H. (2018). Implementation of education management standard in the Guidance of private islamic high school. Jurnal Pendidikan Islam, 4(1), 75-86.

[16] Caldwell, B. J., & Spinks, J. M. (2021). The self-managing school. Routledge.

[17] Sanyal, B. C. (2024). Higher education and employment: An international comparative analysis. Taylor & Francis.

[18] Azmi, I. A. G., Hashim, R. C., & Yusoff, Y. M. (2018). The employability skills of Malaysian university students. INTERNATIONAL JOURNAL OF MODERN TRENDS IN SOCIAL SCIENCES (IJMTSS), 1(3).

[19] Oguntimehin, Y. A. (2018). The Relationship between Entrepreneurship Education and Studentsâ€™ Entrepreneurial Intentions in Ogun State-Owned Universities, Nigeria. NIU Journal of Humanities, 3(2), 285-294.

[20] Abbas, J., Kumari, K., & Al-Rahmi, W. M. (2024). Quality management system in higher education institutions and its impact on students' employability with the mediating effect of industry–academia collaboration. Journal of Economic and Administrative Sciences, 40(2), 325-343.

[21] Cheng, M., Adekola, O., Albia, J., & Cai, S. (2022). Employability in higher education: a review of key stakeholders' perspectives. Higher Education Evaluation and Development, 16(1), 16-31.

[22] Scott, F. J., Connell, P., Thomson, L. A., & Willison, D. (2019). Empowering students by enhancing their employability skills. Journal of Further and Higher Education, 43(5), 692-707.

[23] Wangweiyi Shan,Dong Li,Shulin Liu,Mengmeng Song,Shungen Xiao & Hongli Zhang. (2024). A random feature mapping method based on the AdaBoost algorithm and results fusion for enhancing classification performance. Expert Systems With Applications124902-124902.

[24] Jianxiao Bian,Jiarui Wang & Qian Yece. (2024). A novel study on power consumption of an HVAC system using CatBoost and AdaBoost algorithms combined with the metaheuristic algorithms. Energy131841-.

[25] Xuan Yang & Fuyuan Xiao. (2024). An improved density peaks clustering algorithm based on the generalized neighbors similarity. Engineering Applications of Artificial Intelligence(PA),108883-108883.

[26] Zihao Cai,Zhaodong Gu & Kejing He. (2024). A self-adaptive density-based clustering algorithm for varying densities datasets with strong disturbance factor. Data & Knowledge Engineering102345-102345.

[27] Juliana Sarquis,Letícia Martins Raposo,Carolina R. Sanz,Ana Montoya,Juan Pedro Barrera,Rocío Checa... & Guadalupe Miró. (2024). Relapses in canine leishmaniosis: risk factors identified through mixed-effects logistic regression. Parasites & Vectors(1),357-357.