Research and Design of a Job Search Service Platform Based on Recommendation Algorithm

Huili Chang, Tian Shi

NINGXIA INSTITUTE OF SCIENCE AND TECHNOLOGY, Yinchuan 753000, China.

Abstracts: *In recent years, with the rapid development of higher education in China, the number of graduates has continued to increase significantly. The country attaches great importance to the employment of college graduates. The report of the 17th National Congress of the Communist Party of China clearly puts forward the overall requirement of "implementing the strategy of prioritizing education development and actively doing a good job in the employment of college graduates". Increasing the intensity of employment informatization is an effective means to promote employment. This article follows the software development lifecycle method to complete the research and design of the platform. The platform is divided into three major functional modules: personal job search, enterprise recruitment, and backend management. It mainly realizes the registration and login of two different types of user roles, the editing and delivery of resumes by job seekers online. The platform realizes intelligent recommendation and position retrieval based on job seeker search and collection records, as well as recruitment information management, enterprise management, and user review functions. The implementation of the platform meets the current job hunting needs of graduates, overcomes the time and space limitations of traditional offline job fairs, and uses recommendation algorithms to bring more accurate and effective recruitment information to job seekers. It can achieve unobstructed communication and exchange among the three parties and promote graduate employment.*

Keywords*: Recommendation Algorithm; Employment Services; SSM Framework; Job Recruitment*

1. Introduction

1.1 Background and significance of the research project

With the increasing enrollment of universities year by year, higher education has been promoted, but it has brought about increasingly serious employment problems. The main reasons for this are twofold: firstly, there are too many students, and secondly, there is information asymmetry. At present, information classification websites such as Ganji.com and 51Job have played a role in promoting employment to some extent, but overall, they still cannot accurately meet user needs. In such a situation, if precise job information recommendations can be made based on the personal characteristics of job seekers, it will give job seekers an advantage in the current harsh employment environment.

With the advent of the Big data era, the information on the Internet has become more and more complex. The recommendation system is an effective means to manage information overload and is

widely used in network applications. According to different scenarios and application fields, the use of recommendation systems is very diverse. Online recruitment first requires checking whether the applicant's resume and requirements match the job sought, and then the user's personal preferences, which may be reflected in the workplace, work environment, and other factors. Therefore, in order to solve the problem of job recommendation in online recruitment systems, it is necessary to consider the influence of factors such as personal preferences and abilities[1].

Significance of the research topic

A recommendation system can study the characteristics of job seekers, conduct calculations that vary from person to person, and discover job seekers' job intentions through the system, thereby guiding them to find suitable positions for themselves. A good job search service platform not only provides intelligent services for job seekers, but also saves job seekers time, making it convenient and efficient[2].

The recommendation system conforms to the trend of job hunting in the contemporary the Internet age, overcomes the time and space limitations of traditional offline job fairs, and brings more accurate and reliable recruitment information to job seekers. If a job search service platform centered on recommendation algorithms can be widely used, it will play a positive role in reducing social employment pressure.

1.2 Research status at home and abroad

For job search service platforms, how to recommend positions that better meet user needs has become an important research direction. Foreign research mostly focuses on algorithms that recommend users based on their level of interest. For example, algorithms such as KNN and LDA are widely used in personalized recommendations, analyze user historical behavior data to identify their interests and preferences and thereby bring more personalized recommendation results to users [3]. In addition, some researchers have also attempted to improve recommendation accuracy and efficiency by applying machine learning technology to recommendation systems and continuously learning and optimizing algorithms. In the era of Big data, how to apply data mining technology to recommendation systems has become an important topic.

Compared with foreign countries, China's development in this area is relatively lagging behind. However, with China's emphasis on technology, a large number of technical talents have invested in this research [4], among which Sina, Tencent, Baidu and ByteDance are the best. At present, there are many theoretical and technical recommendation systems in China [5-9]. Researchers have proposed a Collaborative filtering recommendation optimization algorithm to improve the recommendation quality. In order to solve the problems of traditional recommendation algorithms, researchers have proposed a similarity calculation method that can effectively calculate the nearest neighbors between target users, thereby more accurately recommending items [10]. However, due to the advantages and disadvantages of various recommendation algorithms mentioned above, many researchers have started to use combination recommendation algorithms for recommendation. This combined recommendation algorithm effectively solves the problems existing in conventional filtering algorithms while improving recommendation accuracy and efficiency.

Overall, job search service platforms based on recommendation algorithms have become a hot research field. In the future, algorithms can be further optimized and improved on the existing basis to

provide more precise, personalized, and efficient services [11].

2. System architecture design

The recruitment system adopts a standard three-layer technical architecture, including application layer, logic layer, and database layer, as shown in Figure 1. The user interface layer is responsible for processing user input and outputting it to the user, verifying the correctness of user input and transmitting it upwards to improve efficiency; The logical layer is the connection between the upper and lower layers, used to establish actual connections in the database. It is necessary to use appropriate means and techniques to establish connections between various databases, in order to be able to query data, update data, and perform other operations, and return the results to the client. The database layer is responsible for storing the actual data.

The advantage of using a three-layer structure is that it can run anytime and anywhere without the need to install specialized software. There are both independent aspects and close connections between each logical layer, and any changes to one layer will not affect the work of other logical layers. This makes it very easy and fast for the extended system to adapt to the above changes.

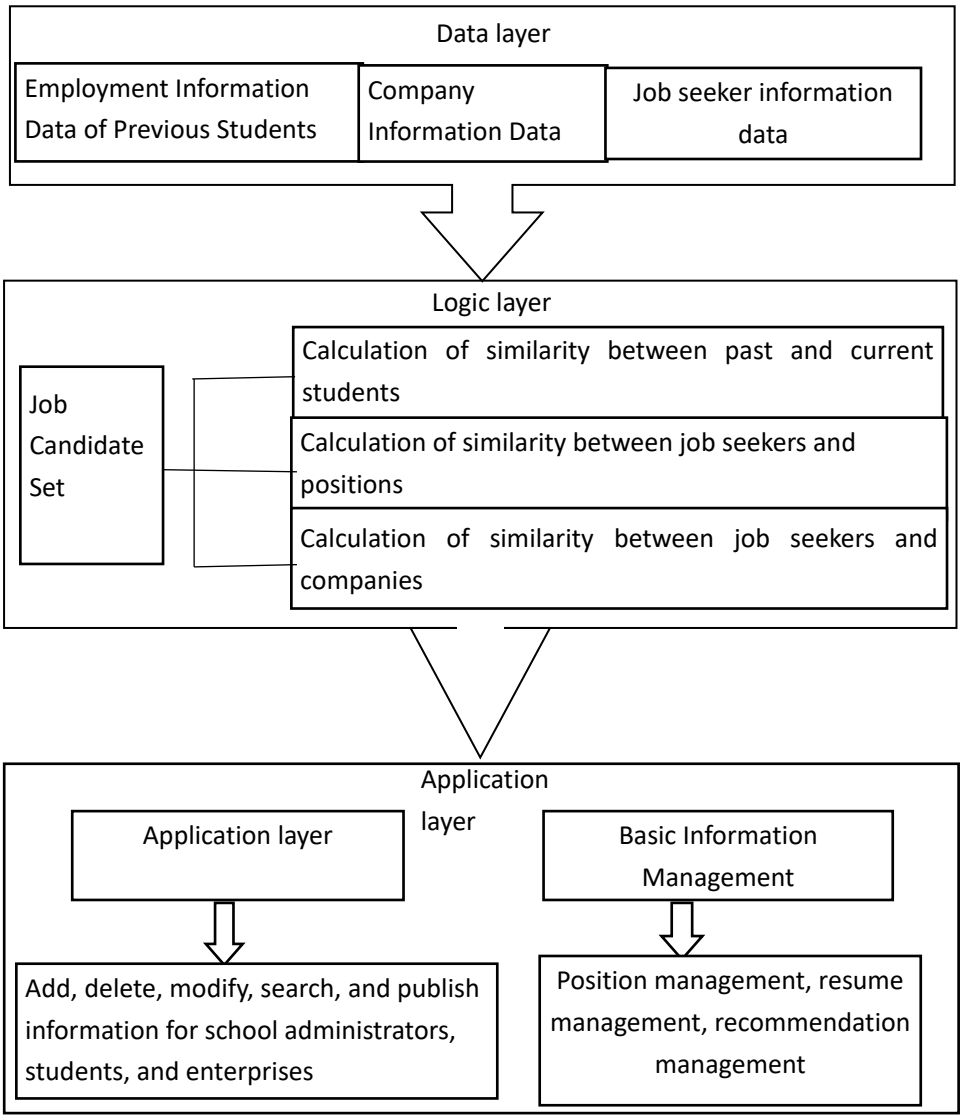

Figure 1: System framework diagram

3. Functional design

According to the preliminary demand analysis, to meet the needs of various users, a job search service platform based on recommendation algorithms should include three modules that meet the needs of various users: personal job search, enterprise recruitment, and backend management. The basic functions of the system include: Personal information management, view recruitment information, view employment status, company information management, recruitment information management, position request management, enterprise management, recruitment information management, etc.

This job search service system consists of three parts: job seekers, recruiters, and administrators. The main functions are as follows:

(1) Job Seekers: manage personal information, view recruitment information, submit resumes, view employment status, and view announcement information.

a. Manage Personal Information: On this page, job seekers can improve their personal information (the initial registration and login function of job seekers), resume (when job seekers need to submit resumes, they must first improve their resume), and password modification (after registration is completed, job seekers can change their account password according to their needs).

b. View Recruitment Information: On this page, users can search for company information (job seekers can search based on their target city and position, and the system will automatically filter out the target enterprise), and browse recruitment information (the system recommends suitable companies to job seekers based on the recommendation algorithm on the homepage, and job seekers can directly browse the recruitment information of each enterprise).

c. Resume Submission: On this page, job seekers can submit resumes to their intended positions.

d. View Employment Status: On this page, job seekers can view job requirements, interview notifications, and job application records.

e. View Announcement Information: In this interface, job seekers can view system announcements.

(2) Recruiter: Company information management, recruitment information management, and position request management.

a. Company Information Management: In this interface, the recruiter can improve company information (the recruiter's registration and login function), complete company information authentication (the recruiter's legal authentication function after registration), and modify passwords (after registration is completed, the recruiter can change their account password according to their own needs).

b. Recruitment Information Management: In this interface, recruiters can publish, modify, and browse recruitment information.

c. Job Request Management: In this interface, recruiters can view and submit resumes of personnel and send interview notifications.

(3) Administrator Side: Job seeker user management, company information management, recruitment information management, and announcement management.

a. Job Seeker User Management: In this interface, administrators can freeze user accounts (administrators can freeze and restrict the use of violating accounts when viewing job seeker user accounts), and unfreeze user accounts (unfrozen user accounts that have already been frozen).

b. Company Information Management: In this interface, administrators can view and review enterprise information (when viewing enterprise accounts, administrators can freeze and restrict the use of illegal accounts).

c. Recruitment Information Management: In this interface, administrators can view and review recruitment information (administrators can delete non compliant recruitment information when viewing recruitment information published by enterprises).

d. Announcement Management: In this interface, administrators can publish, modify, or delete announcements.

4. Design of dynamic recommendation module

This paper applies the user based collaborative filtering algorithm to position recommendation. The user based Collaborative filtering algorithm is used to explore the relationship between the positions posted by new users of job seekers and the positions posted by other users of job seekers. After using the user based Collaborative filtering algorithm, the reasonable recommendation of position resources is realized, and the system is more intelligent [12]. The implementation steps of user based collaborative filtering algorithm in this system are as follows:

Step 1: we can build a matrix based on the historical positions submitted by the job applicant user. Rows represent the number of users, while the list shows the number of positions. If the i-th job applicant user has applied for or saved the j-th position, assign the corresponding values in the i-th row and j-th column of the matrix to 1, otherwise assign 0.

Step 2: we can calculate the similarity between users based on the matrix, and this system uses the Euclidean distance formula to calculate the similarity. The Euclidean distance formula is as follows:

$$d(x,y) = \sqrt{(\sum(xi - yi)^2)} \qquad (1)$$

Step 3: We can bubble sort the two-dimensional similarity array according to the similarity from high to low, and print out the subscripts of the first three users with high similarity in the array according to the similarity from high to low.

Step 4: Each position posted by a similarity user will have a corresponding position ID. If there is a cross between the position ID posted by the new user and the position ID posted by the similarity user, after calculating the similarity user, compare the position ID posted by the new user with the position ID posted by the similarity user. After removing the cross position ID, we can recommend other positions corresponding to all remaining IDs for the new user [13].

5. Database design

Database design is an important task in the detailed design stage of software development. This article mainly elaborates on conceptual structure design and logical structure design.

5.1 Conceptual structure design

In the conceptual structure design stage, it is necessary to analyze and abstract the information and data collected in the requirements analysis, determine the entities, and on this basis, use the relationships between attributes and attributes to integrate various user partial views into the overall view, in order to obtain a conceptual model that does not rely on computers and can reflect user requirements. The conceptual model is a high-level description of the database structure and does not depend on the specific database management system used to execute the database. In the process of conceptual analysis, it is necessary to define and test the established concepts to determine whether they meet the requirements put forward by people. In general, conceptual design can provide a better understanding of the information content in a database. The global E-R diagram of the system is shown in Figure 2.

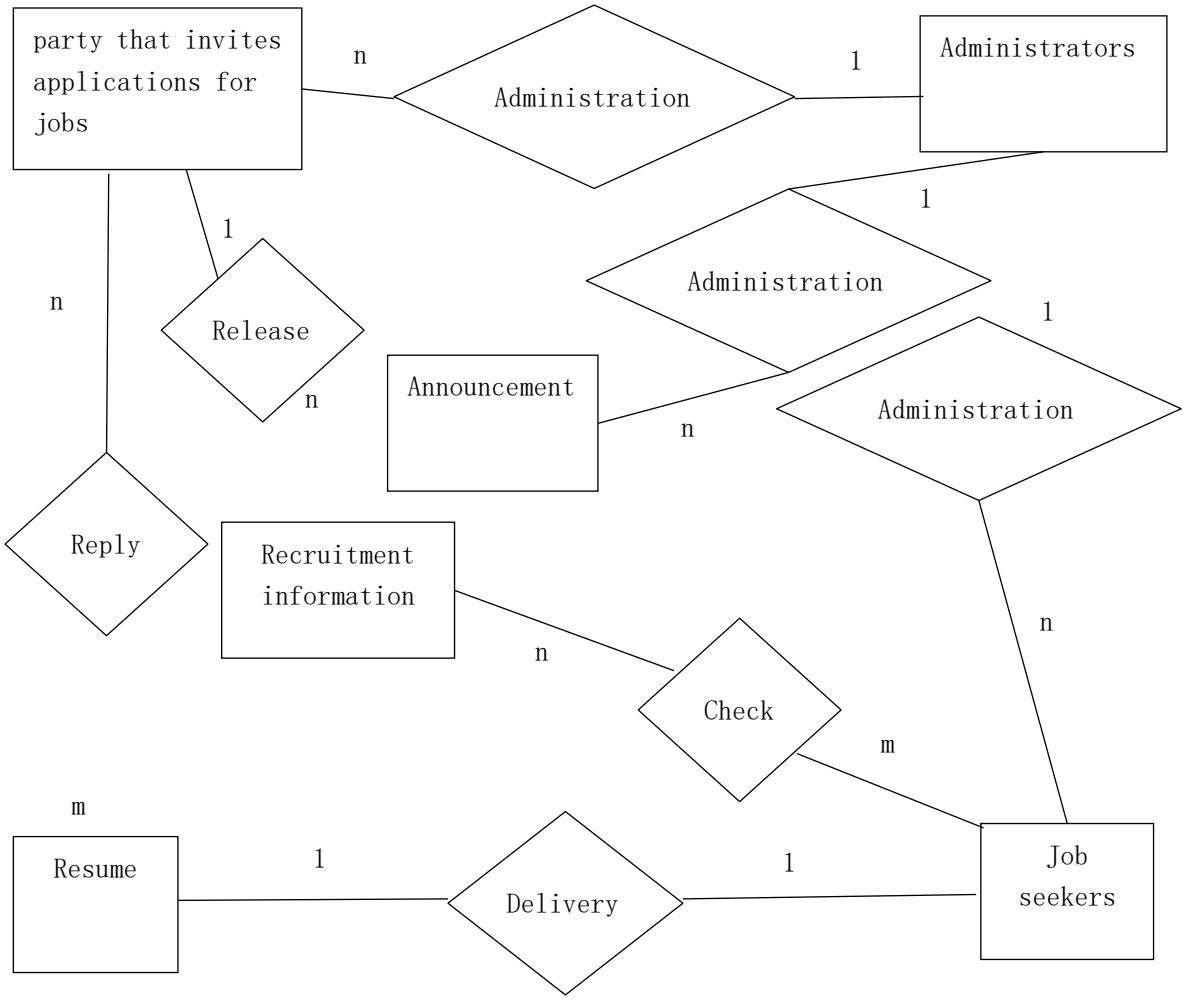

Figure 2: Global E-R Diagram of the System

5.2 Logic structure design

The logical structure design is based on the principle of converting E-R diagrams to relational patterns, adopting the third normal form normalization principle, and optimizing to obtain the following relational patterns to meet data storage and processing requirements.

Administrator manages the system with a login name and login password; Users have a user ID,

username, user phone number, user password, and account status; Enterprise information is comprised of an ID assigned during registration, company name, company address, main business scope, company size, license photo, company registration time, company type, company profile, and contact phone number of the responsible person; Resumes include a resume ID, job applicant ID, name, email, age, gender, address, contact number, education level, work experience, intended position, graduation institution, and expected salary; Recruitment information contains a recruitment information ID, company ID, company name, email, address, contact number, recruitment type, job requirements, salary and benefits, number of recruiters, and publication time; Announcement information is structured by an order ID, content, keywords, title, and announcement time.

6. Conclusion

In order to solve the waste problem caused by graduates' massive posting based on the search recruitment information, this paper designs a job recommendation platform for job seekers to recommend collaborative filtering recommendation algorithm based on content [14]. It has the functions of Personal information management, viewing recruitment information, viewing employment situation, company information management, recruitment information management, etc. It provides the function of traditional on-site recruitment and job search, and can accurately recommend job information according to the characteristics of job seekers, which can enable job seekers to seize the first opportunity in the severe employment situation, with good practicability, and improve the student signing rate.

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