

Elective Courses Recommendation and Occupational Tendency Research Based on Information and Course Grades of College Students

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Abstract—In this paper, based on the information and the course grades of college students, it uses SVM algorithm to analyze the curriculum and occupational preference of all students and give the evaluation results. It proposes to analyze the overall distribution of curriculum and occupational orientation of students under the several influencing factors. It recommends more appropriate elective courses and more suitable employment direction for college students. The results of statistical analysis can provide foundation for teaching reform and curriculum reform, and also provide data basis for the formulation of enrollment plan. At the same time, it proposes to use expert system to generate occupational tendency assessment results of students automatically. Finally, it constructs the PPI control model for the enrollment plan.

Keywords—elective courses recommendation; course grade; occupational tendency; education reform

I. INTRODUCTION

Big data has now penetrated into every industry field and become a path to change the operation way of scientific research, business and government. Big data and its related technologies show broad prospects for development and application value in various fields [1]. There are huge economic values and social benefits in big data. Machine learning algorithms, as the effective analysis methods of big data, can efficiently mine its intrinsic value. How to effectively analyze its internal data structure, establish the data links, and mine the intrinsic value of big data, is the current research focus in the field of artificial intelligence. To make full use of the value of big data, high-quality data is the premise and basis for the effectiveness of big data, and data analysis technology is an important means for analysis of big data[2]. Only when we have reliable and accurate big data with high quality, and

use the effective machine learning algorithms, can we mine the hidden useful information from big data.

College students have a lot of data information, such as gender, entrance grades, different origins, different family and economic situation, different majors and so on. At the same time, college students also produce a lot of data in every semester, for example, the grades of each course, different points of mark, etc. These data reflect the tendency of students to choose elective courses and employment. Make full use of information of students, we can adopt machine learning algorithm to mine the personal professional interests of students. According to the analysis results, we can recommend more appropriate elective courses and more appropriate employment direction for college students. The results of statistical analysis can provide data foundation for teaching reform and curriculum reform of university, and also provide data basis for the formulation of enrollment plan.

II. RELATED WORKS

A. Current situation and Trend of Big Data on Curriculum and Career Orientation

Occupational orientation refers to the integration of various qualities that individuals are more likely to succeed when they engage in a certain profession. For different individuals, their occupational orientation is different. It is closely related to individual career choice, career success or not, individual career satisfaction. It mainly refers to the personality characteristics of the individual matching the career. It can be seen that occupational tendency is of great importance to individuals.

According to Holland theory, the typical occupational orientation can be divided into six categories, including social type, enterprise type, regular type, realistic type, research type, artistic type.

The data analysis of elective courses and professional orientation of college students is a process including information integration, feature extraction, data mining and evaluation involving many subjects and many factors. With the support of modern information technology, we can integrate and make full use of all kinds of big data and resources that affect the course and employment choices of students. We can analyze, mine and evaluate the big data of college students by using the related technology of big data, so as to realize the intelligent management of employment and enrollment for college students. It provides a scientific basis for decision-making college enrollment and employment of students. The research reflects the inevitable development trend of the big data era and conforms to the national development strategy. It is certain urgent and necessary.

B. Current Situation and Trend of College Occupational Orientation Test

Nowadays, with the popularization of higher education in our country, more and more college students are confused about their career development, such as unemployment after graduation. Cao mentions to conduct the vocational orientation test by means of questionnaires and collect the questionnaires after completing the test [3]. Wang proposes that the test questionnaire of Holland professional personality type is used to conduct research, take the class as a unit to test, and then collect the data [4]. The test can help to understand the situation of education and teaching for schools. The article has noticed that the results of vocational orientation test can provide reference and basis for improving the enrollment work, but there is no description of how to improve the enrollment work. Zhang mentions that Holland Vocational Personality Type Test Questionnaires for vocational school disabled students are carried out for occupational orientation analysis, while analyzing six typical occupational orientations with the proportions of gender, different majors, different grades, different sources and family economy of students [5].

C. Current Situation and Trend of Employment Management System for College Students

Employment is an important part of western economics. In particular, the United States, Japan and other countries have formed a number of relatively perfect employment management model in the long-term practice of employment management. Hong pointed out that the key to the high employment rate of Sweden lies in the collaboration between the systems of national policies, laws and regulations, unemployment assistance, employment supervision, employment market, employment services, career planning and so on [6]. Wei refers to a framework model for analysis and management from different aspects such as employment policy, employment concept, employment ability and employment market [7]. But it does not describe the use of the theory of vocational orientation in this model to enhance the employment quality of students.

To sum up, the following conclusions can be drawn:

1) At present, the method adopted in the occupational aptitude test in universities is manually filled in questionnaires. This method takes a lot of time in the process of filling in and evaluating. At the same time, some students will consciously choose or avoid some answers in the process of filling in, which will affect the evaluation results.

2) At present, some researches have proposed the construction of employment management software system. Through the analysis and management from employment policy, employment concept, employment ability, employment market and other aspects, it can improve the employment quality of students. But there is no description of the theory of occupational orientation in the model.

3) At present, some researchers have mentioned that the results of professional orientation test can provide support and basis for improving the enrollment work, but there is no description of how to improve the enrollment.

Therefore, we formulate the implementation scheme as follows:

1) In the elective course selection management system of college students, we adopt a certain model and algorithm to automatically recommend suitable elective courses for students according to their examination results and personal preferences.

2) In the employment management system of college students, a certain model and algorithm are adopted to realize the automatic evaluation of vocational orientation according to the examination results and course selection of students. The advantage is that it does not need extra time to fill in and evaluate the questionnaire, and the other advantage is to avoid students deliberately choosing or avoiding some answers, thus enhancing the objectivity of the evaluation results. The results of the automatic evaluation will be linked with the enterprises or posts in the employment management system to improve the efficiency and quality of employment of college students. The model is to take the results of the vocational orientation test and the actual demand of the employment market as input, and control the enrollment plan to meet the demand of the employment market.

III. CURRICULUM RECOMMENDATION AND EMPLOYMENT TENDENCY BASED ON INFORMATION AND CURRICULUM ACHIEVEMENTS OF STUDENT

A. Using Machine Learning Algorithm to Analyze the Elective Curriculum and Occupational Orientation of Students

Machine learning algorithm can used to analyze the evaluation results of elective curriculum and occupational orientation of all students. We collect the various influencing factors, such as different disciplines, gender, subject and specialty, different grades, educational levels, achievement distribution, different experience, different places of origin, different family economic situation and so on.

Principal component analysis (PCA) is used to reduce the dimension of the influencing factors of elective curriculum

and occupational orientation of students and simplify the influencing factors. Then we adopt Support Vector Machine(SVM) to analyze the relation between the influencing factors and six occupational orientations. The influencing factors are features, and six occupational orientations of Holland are categories. As a classification algorithm, SVM can build a model with the features and categories and predict the classification results by training the model. According to the results of prediction, we propose the elective curriculum and occupational orientation of students, and automatically recommend suitable elective courses for students according to their personal preferences. Then we can give the statistical analysis results of overall distribution in the elective course selection management system of college students.

The analysis results of statistics can provide data support for the teaching reform and curriculum reform of university, and also provide input for the formulation of enrollment plan. It also lays a foundation for the subsequent use of control theory to control the enrollment plan.

B. Automatically Generating Occupational Tendency Assessment Results of Students Using Expert System

Expert system is one of the most important and active application in the fields of artificial intelligence. It realizes the great breakthrough of artificial intelligence from theoretical research to practical application, and from general reasoning strategy to the application of specialized knowledge. Expert system is usually composed of six parts: human-machine interaction interface, knowledge base, inference engine, interpreter, comprehensive database, knowledge acquisition. In particular, knowledge base and reasoning machine are separated from each other.

The expert system reads the examination results of all subjects from the comprehensive database and the selection of all elective courses, and matches the rules in the knowledge base repeatedly by inference engine according to the six basic occupational orientations in the theory of Holland. Finally, it obtains the evaluation results of the occupational orientation of college students.

It can improve the existing employment management system of college students and increase the automatic assessment function of career orientation for college students. By consulting all scores of subjects in the student management system, as well as the elective courses of students, and combining with artificial intelligence, this function can automatically generate professional orientation evaluation results of students and provide effective guidance and support for employment of students.

C. Adopting Control Theory to Control Enrollment Plan

Based on the occupational tendency assessment of students and the situation of employment market, we construct the control model as shown in the following figure. The enrollment situation of this year will not be effective until four years after the graduation of students. Therefore, the Predictive Proportion Integration (PPI) control is adopted.

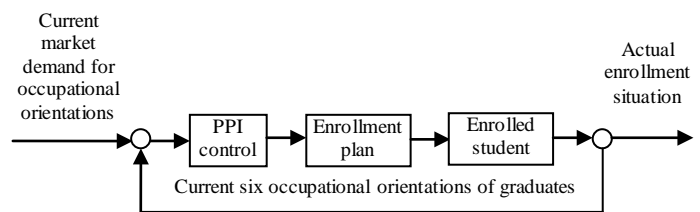


Fig. 1. Control figure of student enrollment plan.

The input of the model is the current market demand for six occupational orientations, and the feedback is the current six occupational orientations of graduates, and the output is the actual enrollment situation.

The PPI controller is mainly composed of two parts: PI and prediction. There are 5 parameters, of which 3 parameters are adjustable. The relationship between the input and output of the controller can be represented by the following expression.

$$u(t)=K(1+\frac{1}{pT_i})e(t)-\frac{1}{pT_i}[u(t)-u(t-l)] \quad (1)$$

P is called the differential operator, $e(t)$ is the input of the controller, $u(t)$ is the output of the controller, $K(1+\frac{1}{pT_i})e(t)$ is the PI controller, $-\frac{1}{pT_i}[u(t)-u(t-l)]$ is the predictive controller. For the selection of controller parameters, K is generally chosen as the reciprocal of process gain, T_i is the dominant time constant of the process, L is the lag time of the process.

The model improves the existing student enrollment management system in the colleges and universities, and increases the prediction function of enrollment plan. By analyzing the occupational orientation assessment of students and the occupational orientation proportion of all positions in the employment market this year, the function adopts the PPI controller in the control theory to control the enrollment situation, and provides the suggestion for the enrollment plan.

IV. RESEARCH SIGNIFICANCE

To scientifically analyze the vocational orientation of college students, we should make full use of the examination results from the management system and the employment management system of college students, adopt artificial intelligence and technology of big data, combine the examination results and elective courses of students, and automatically evaluate the vocational orientation of each student. In this way, students can be allowed to make a plan about the major and career as soon as possible, especially in the future job hunting or higher education. It is of great significance for enhancing the career competitiveness and sustainable development.

With the rise and fall of various industries, the proportion of the six typical occupational orientations in the job market is

changing every year, and the demand for various jobs is also changing. According to the six typical occupational orientations of each year and the forecast of post demand after four years, we can use control theory to control the enrollment plan, such as the number of professions, sex ratio, region and so on, so as to make the enrollment and market demand more closely linked.

A. Theoretical Significance

1) It can verify the value of artificial intelligence algorithms in the application of occupational orientation. Through algorithm of artificial intelligence, the students are classified into six occupational orientations according to the examination results and elective courses of students. and Through the follow-up survey of students after employment, it can verify the correctness of the analysis to use artificial intelligence algorithm for occupational orientation of students.

2) It can verify the value of big data related algorithm in the application of occupational orientation. Through big data, we can analyze the proportion of six typical occupational orientation in different educational levels, different majors, different sexes, different elective courses of college students. According to different occupational groups, we can adopt the different teaching methods, optimize teaching materials, and improve teaching effect.

3) It can verify the feasibility of using control theory algorithm in employment and enrollment of college students. With the rise and fall of various industries, the proportion of different occupational orientations in the job market will also change in each year. By analyzing the proportion of each occupational orientation in each year and predicting the proportion of each occupational orientation after several years, we use the analysis results as a feedback to control the enrollment of students every year. In this process, the relevant control theory algorithm is used to control the annual enrollment plan, such as the number of professions, gender ratio, geographical ratio and so on, so as to make the enrollment and market demand more closely linked.

B. Application Significance

1) It can perfect the student employment management system. In the student employment management system, we should add the function of automatically giving the evaluation results of professional orientation according to the examination results and elective courses of students. When the students are going to graduate and be employed, it automatically generates the post of enterprises with high degree of correlation with the professional orientation of students from the enterprises registered in the school recruitment.

2) It can perfect the student enrollment management system. According to the position forecast in the market, as well as the actual employment situation of students, it can

control the number and proportion of students enrollment, such as professional, gender, educational level, etc.

3) It can enhance the competitiveness of students. It helps the students know themselves as soon as possible, and do a good plan in time for the promotion and job-hunting to improve their competitiveness.

V. CONCLUSION

According to the information and the course grades of college students, we uses SVM algorithm to analyze the curriculum and occupational preference of all students and give the evaluation results. It proposes to analyze the overall distribution of curriculum and occupational orientation of students under the several influencing factors. Principal component analysis (PCA) is used to reduce the dimension of factors affecting the curriculum and occupational orientation of students and simplify the factors. It recommends more appropriate elective courses and more suitable employment direction for college students. The expert system is used to automatically generate occupational tendency assessment results of students. It also constructs the PPI control model for the enrollment plan. The results of statistical analysis can provide the foundation for teaching reform and curriculum reform, and also provide the support for the formulation of enrollment plan. Finally, the research significance is given.

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