Research on Ideological Course Recommendation System based on Support Vector Machine

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Abstract: With the deepening of students' Ideological education in Colleges and universities, as the main channel to cultivate students' world outlook, values, outlook on life and socialist core values, ideological courses occupy an important position in College Ideological education. In view of the problems existing in the curriculum of Ideological education in Colleges and universities, such as single form, weak pertinence, lack of synergy and unable to form a personalized collaborative education mechanism, a college ideological Curriculum recommendation system based on improved collaborative filtering technology is developed, which adopts an improved collaborative filtering algorithm based on hybrid, By introducing the gradual forgetting curve based on the timeliness change of user interest, the disadvantages of traditional collaborative filtering algorithms such as low efficiency, weak adaptability and novelty elimination are better solved. In order to solve the problems of long server response time and low user preference for the system recommendation results in the practical application of the recommendation system based on knowledge map, the research on the curriculum ideological Teaching Resource Recommendation System Based on big data is carried out. In the hardware part, the selection of underlying physical host and database server are designed; In the software part, this paper designs the reading and search of curriculum ideological teaching resources based on big data.

1 INTRODUCTION

With the development of modern science and technology, informatization and networking have become the development trend in China .At the same time, with the development of China's higher education from elite education to popular education, the expansion and expansion of colleges and universities and the running of multi campus schools, ideological teachers have the reality of "mobile teaching" in teaching practice, ideological teachers have less and less time to contact students outside class, and students' consolidation and review of knowledge completely rely on their own efforts (Chen, 2017). Such a way is more likely to result in a lack of in-depth understanding of the ideological course, and students' learning has a strong utilitarian mentality, resulting in students learning for the examination in the ideological course. Therefore, how to make efficient use of extracurricular time, strengthen students' guidance on Ideological courses, deepen college students' understanding of Ideological course knowledge, cultivate students' logical thinking ability, and strengthen the teaching effect of Ideological courses has become another thinking focus for the innovation of teaching methods of Ideological courses in Colleges and universities (Chen, 2016). With the help of the current popular idea of curriculum network, this paper constructs a network platform that can be specially used for the learning and communication of College Ideological courses. In the Internet era, the data of curriculum ideological teaching resources are increasingly rich, and their forms are gradually diversified, which puts forward higher requirements for the storage, processing and analysis of curriculum teaching resources (Chang, 2017).

The traditional stand-alone architecture server has been unable to meet the needs of unstructured data and diversified processing of current curriculum ideological education resources. There is an urgent need for a virtualization technical means to build the server cluster. Relevant researchers have conducted in-depth research on the above problems, and (Liu, 2021) put forward some storage, processing and analysis methods of curriculum ideological teaching resources from many aspects. However, the

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above methods can not realize the centralized processing of curriculum ideological teaching resource data in the process of application. Moreover, the application of various methods also increases the operation pressure of traditional servers, which seriously limits the storage capacity and computing power of the system. Moreover, some teaching resources are stored in the system in the form of dark information, which can not be obtained by users, and it is difficult to make full use of all data. In order to improve the utilization rate and value of curriculum ideological teaching resources, this paper studies the curriculum ideological teaching resources recommendation system based on big data, and verifies the effectiveness of the design system through experimental comparison, in order to provide users with higher precision and faster recommendation services (Li, 2018).

2 SUPPORT VECTOR MACHINE

2.1 The Concept of Support Vector Machine

Support vector machine is a machine learning method based on statistical learning theory, dimension theory and structural risk minimization principle. It shows many unique advantages in solving the problems of small sample, nonlinear and high-dimensional pattern recognition, and overcomes the problems of "dimension disaster" and "over learning" to a great extent. In addition, it has a solid theoretical foundation and a simple mathematical model. Therefore, it has made great progress in the fields of pattern recognition, regression analysis, function estimation and time series prediction, and is widely used in text recognition, handwritten font recognition, face image recognition, gene classification and time series prediction (Li, 2017). The standard support vector machine learning algorithm problem can be reduced to solving a constrained quadratic programming problem. For small-scale quadratic optimization problems, mature classical optimization algorithms such as Newton method and interior point method can be well solved. However, when the training set is large, there will be some problems, such as slow training speed, complex algorithm, low efficiency and so on. Data based machine learning is an important research content and direction in modern artificial intelligence technology. Its main research is to find laws from observed data, and use these laws to predict future data or unobservable data. Data based machine learning can be roughly divided into three implementation methods, as shown in Figure 1:

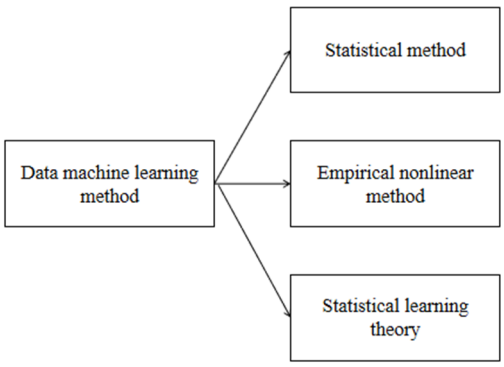

Figure 1: Data machine learning method.

The first is the classical statistical estimation method. The second is empirical nonlinear methods, such as artificial neural networks. The third method is statistical learning theory. At present, some mainstream training algorithms decompose the original large-scale problem into a series of small problems, solve the small problems repeatedly according to some iterative strategy, construct the approximate solution of the original large-scale problem, and make the approximate solution gradually converge to the optimal solution. However, how to decompose the large-scale problems and how to select the appropriate working set are the main problems faced by the current training algorithms, and they are also the performance of the advantages and disadvantages of each algorithm. In addition, the existing large-scale problem training algorithms can not completely solve the problems faced. Therefore, it is imperative to make reasonable improvement on the original algorithm or study new training algorithms. Firstly, this paper systematically introduces the theory of support vector machine, then summarizes the current training algorithms, and looks forward to the future research direction.

2.2 Support Vector Machine Algorithm

The training of support vector machine needs to solve a problem. Traditional optimization algorithms, such as interior point algorithm, can not be directly used to solve the problem of SVM because of the limitation of computer memory capacity. So far, in order to solve the training problem of SVM, several algorithms have been developed to overcome the difficulties, so as to better train SVM. This chapter introduces a new SVM training method, which uses particle swarm optimization algorithm to optimize

the quadratic programming problem of SVM, and tests and compares it through experiments. The idea of support vector machine classification algorithm is to find the hyperplane with the largest classification interval in its high-dimensional feature space and separate the two types of samples. SVM is developed on a solid theoretical basis and has better generalization performance. However, in the training of SVM, especially for large-scale sample data sets, the quadratic programming problem that must be solved is the restriction of the development and application of SVM. For the sample data set, the quadratic programming includes optimization variables, linear inequality constraints and equality constraints, and involves the calculation of dimensional kernel function matrix and the multiplication of matrix and vector. Figure 2 shows the learning system model:

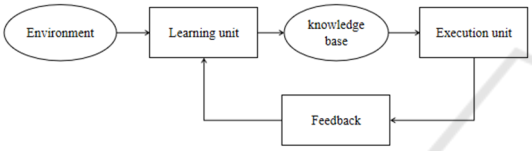

Figure 2: Learning system model.

In optimization theory, there are many mature algorithms, such as quasi Newton method and general software toolkit, which can be used as the training algorithm of SVM. It is extended to the case with soft boundary. However, the learning speed of this method is not as fast as that of traditional QP software, especially in the case of small data sets. Therefore, this kind of method has rarely been applied to the training of SVM. The second kind of algorithm is the most studied and has good application effect. The basic idea of the second method is to decompose the large-scale QP problem into a series of small-scale QP problems. In each iteration, the traditional optimization algorithm is used to solve a sub QP problem and update it α A fractional quantum set of, that is, the working set. These methods are collectively referred to as decomposition algorithms. The main differences are the size of working set, the principle of generating working set and the solution method of sub QP problem of working set. As for the third kind of incremental online training algorithm, its particularity is that the number of training samples is unknown. In the process of use, training samples will be added continuously, which is mainly used for online system identification.

3 IDEOLOGICAL COURSE RECOMMENDATION SYSTEM

3.1 System Hardware Design

In order to effectively recommend curriculum ideological teaching resources, big data technology is introduced, HDFS distributed is taken as the basic structure of this system, the data files of curriculum ideological teaching resources are stored and read by calling hdfsapi interface, and the basic information of system users is stored by using resource sharing platform. The hardware structure of the recommended system is shown in Figure 1: combined with the structural composition of the system hardware, this paper mainly designs the underlying physical host and database server. The underlying physical host is the core hardware structure of the system recommended in this paper, and Inspur server is selected as the underlying physical host. The server of this model has CPU and adopts Xeon Series CPU. The main frequency of CPU is 1066MHz, the memory is 32GB, the capacity of hard disk is 1000gb, the speed of hard disk is 12000 rpm, and the memory type is DDR3. At the same time, the underlying physical host of this model has a continuous data protection mechanism, which can reduce the probability of system downtime to a certain extent, and further improve the stability and data fault tolerance of the system, so as to cope with the increasing curriculum ideological teaching resources in the future. And build a hardware resource pool including various computer resources, storage resources and curriculum ideological teaching resources, manage the hardware resource pool of Inspur server through the client, and then virtualize all hardware resources in the resource pool to generate several independent virtual machines, so as to reduce the burden of system operation. Figure 3 shows the system hardware design structure:

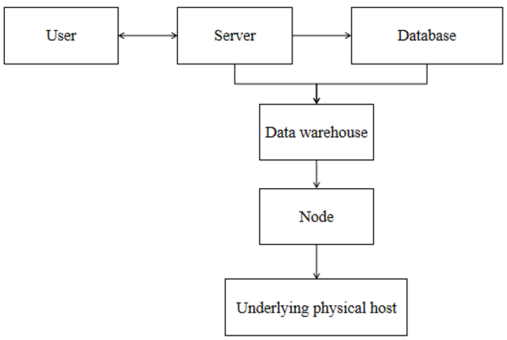

Figure 3: System hardware design structure.

The database server is mainly used to store the operation parameters generated during the operation of the recommendation system and the ideological teaching resources of various courses. Considering the capacity of current curriculum ideological teaching resources and the growth trend of future resources. In order to realize the effective recommendation of teaching resource data, it is necessary to store enough teaching resource data in the system. This paper uses big data technology to read the ideological teaching resources of various courses. After reading the ideological teaching resources of all courses, the distributed search method is used to search them. Therefore, the distributed search engine can be deployed on the distributed cluster, and an index database for curriculum ideological teaching resources can be constructed to accurately retrieve the curriculum ideological teaching resources in the big data platform, so as to realize the retrieval function of the recommendation system in this paper. After receiving the corresponding request information in the system background, search the relevant data information in the resource database by calling. If the relevant index information is queried, the searched curriculum ideological teaching resource data will be displayed to the system user.

3.2 Improvement of Recommendation System of Ideological Course

Through the actual investigation of front-line teachers and students, the functional requirements analysis of College Ideological course recommendation system based on improved collaborative filtering algorithm is formed. On this basis, the functional logic of the system is designed, and the overall functional framework of the system is designed according to the general process of software engineering design (Mangeli, 2019). The system uses B / S architecture to build the implementation framework. The functional module design of the system follows the principles of practicality, modularity and scalability. The core module of the system mainly includes the course selection sub module of College Ideological course, the student evaluation sub module of College Ideological course, the recommendation sub module of College Ideological course, and the system maintenance and update sub module. Each sub module works together under the control of the system workflow, Build an efficient and practical closed-loop dynamic recommendation mechanism for ideological courses in Colleges and universities, form a virtuous circle, and provide a basic guarantee for the development of Ideological education in Colleges and universities. After determining the application student group, carry out the system initialization operation, mainly complete the input of the ideological course information currently opened by the school and the students' preference information for each course in the past historical cycle, and write the initial value to the system data warehouse as the initial cold start data set of the improved collaborative filtering algorithm; Start the personalized scoring mechanism of Ideological education curriculum, and evaluate the personalized ideological education plan formulated by colleges and universities from multi-dimensional effect evaluation; Start the personalized recommendation sub module of Ideological education courses, recommend personalized and accurate ideological courses for different students, improve students' points of interest, and ensure the formation of a three-dimensional education situation of "watering flowers and roots, teaching people and teaching heart" of Ideological education in Colleges and universities.(Mohammadmehdi, 2018). The learning problem can be generally expressed as an unknown dependency between the output variable y and the input variable x, that is, it follows an unknown probability measure. The machine learning problem is based on an independent and identically distributed observation sample, namely formula (1):

$$(x_1, y_1), (x_2, y_2), ..., (x_t, y_t) \quad (1)$$

In a set of functions, find an optimal function and estimate the dependency, so that the expected risk is as shown in formula (2):

$$R(w) = \int L(y, f(x, w)) dF(x, y) \quad (2)$$

For pattern recognition problems, the output can be expressed as y = {0,1} or {1, − 1} respectively. The predicted function is called the indicator function, and the loss function can be defined as formula (3):

$$L(y, f(x, w)) = 0, if y = f(x, w) \quad (3)$$

In order to improve the portability of the system, a college ideological course recommendation system based on improved collaborative filtering algorithm is developed by using the idea of modular design and calling the form of dynamic link library files(Saranjam 2016). The system can realize the course selection and course evaluation of College Ideological courses, the preference data statistics of students for specific ideological courses Personalized and accurate ideological course recommendation for different students. The main reason for this phenomenon is that the design system automatically filters the curriculum ideological teaching resources

that do not meet the requirements, and adds more operating conditions in the process of system design, so as to realize the good recommendation of curriculum ideological teaching resources. The course Ideological teaching resource recommendation system designed by using big data technology can shorten the response time of the system server and provide users with more accurate recommendation services on the basis of fully meeting user preferences (TingLong, 2018).

4 CONCLUSIONS

Based on big data technology, a new curriculum ideological teaching resource recommendation system is designed, and the feasibility and advantages of the design system are proved by comparative experiments. (Wang, 2020). However, due to the limited research ability, the system designed in this paper still has some deficiencies. For example, users can not avoid repeatedly uploading the same curriculum ideological teaching resources, resulting in repeated storage of resource data. Therefore, in the next research process, we also need to carry out research on the above deficiencies, so as to further improve the Teaching Resource Recommendation effect of the design system. In view of the problems existing in the current curriculum of Ideological education in Colleges and universities, such as mechanical rigidity, weak pertinence, lack of synergy and inability to form a personalized collaborative education mechanism (Zhao, 2017), a college ideological Curriculum recommendation system based on improved collaborative filtering technology is developed, which adopts an improved collaborative filtering algorithm based on hybrid, By introducing the gradual forgetting curve based on the timeliness change of user interest, an optimized College Ideological course recommendation model is designed. The simulation shows that the model solves the disadvantages of low efficiency, weak adaptability and novelty of the traditional collaborative filtering algorithm. Personalized and accurate ideological course recommendation for different students. The system design logic is clear, the internal working logic meets the general requirements of software engineering, the division between functional modules is reasonable, the expected design purpose is well completed, and the conditions for popularization and use in Colleges and universities in China are preliminarily met.

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