



Design and Construction of Personalized Recommendation Teaching System Under Artificial Intelligence Background

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Abstract. Facing the problem of single teaching mode in teaching reform, this paper studies the personalized recommendation teaching system under the artificial intelligence background of sharing teaching resources to improve teaching quality and strengthen students' autonomous learning ability. The system adopts the framework of Springboot + Vue + Mybatis to separate the front end from the back end, and MySQL 8.0.28 is selected to help manage the data. Aiming at the educational demand of information technology, this paper designs and implements a personalized recommendation teaching system under the background of artificial intelligence. This paper introduces the system structure design, the implementation process of collaborative filtering recommendation algorithm CF and other solutions.

Keywords: artificial intelligence · personalized recommendation · collaborative filtering algorithm · Teaching system design

1 Introduction

With the continuous development of the information age, more and more disciplines try to combine with network technology to extend the online classroom teaching method. Online classroom is loved by more and more teachers and students because of the huge amount of teaching resources. However, the current online teaching system has some shortcomings in resource sharing. In the massive teaching resource database, the presentation of teaching resources is too single, ignoring the individual needs of different students. Students often spend a lot of time looking for teaching resources suitable for them [1].

By integrating artificial intelligence technology into online classroom teaching, a personalized recommendation teaching system can be realized, and then the above problems can be solved. The personalized recommendation teaching system studied in this paper can not only consider the students' personalized demand for video resource course selection, but also recommend the learning content suitable for each student according to their personal preference, thus effectively improving the learning efficiency and enthusiasm of the students [2].

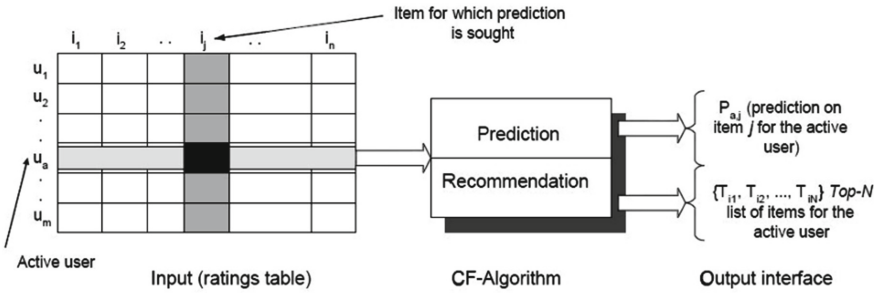


Fig. 1. Principle of collaborative filtering algorithm

2 Key Technologies

2.1 Artificial Intelligence Technology

Artificial Intelligence technology (AI) is a new subject based on computer science, in which multidisciplinary knowledge permeates each other. The key way to realize artificial intelligence is machine learning technology. This paper focuses on machine learning, which can improve the efficiency of application development by using and optimizing the performance of algorithms [3].

2.2 Collaborative Filtering Algorithm

Collaborative filtering algorithm (CF) is the most widely used algorithm in the design of recommendation system. Its principle is to classify users with the same historical browsing or the same liking into the same group, and then summarize the remaining items that this user group is most interested in and recommend them to current users [4].

The process of collaborative filtering algorithm is shown in Fig. 1. In CF, a matrix is usually used to express the user’s preference for items. And use 1 and 0 to indicate whether the user has bought an item. The process of collaborative filtering algorithm is divided into prediction and recommendation. The prediction process is to judge by the user’s score of the possibility of not buying the goods. And the recommendation process is to recommend the user’s goods according to the result of the prediction stage [5].

2.3 Development Environment

According to the amount of data needed, the personalized recommendation teaching system environment consists of four physical machines. The Java development tool used in the JavaWeb application of this system is IDEA 2021.1.3, JDK 1.8 is used as the development environment, Java is used as the development language, and Apache Tomcat 9.0 is used as the server building. The development of the system is based on MVC pattern, and the framework of Springboot + Vue + Mybatis is adopted to realize the separation of front end and back end, and MySQL 8.0.28 is selected to help manage data. In order to simplify the dependency configuration of system development, springboot development framework is used instead of the traditional spring framework. During the

```

<dependency>
  <groupId>org.springframework.boot</groupId>
  <artifactId>spring-boot-devtools</artifactId>
  <scope>runtime</scope>
  <optional>true</optional>
</dependency>
<dependency>
  <groupId>mysql</groupId>
  <artifactId>mysql-connector-java</artifactId>
  <scope>runtime</scope>

```

Fig. 2. Pom import dependency graph

configuration process, you need to go through the startup class of @ SpringbootApplication to start running. In the process of configuration of dependencies, pom.xml is used for unified management, and the development functions are divided into several starter dependencies for import and use, thus realizing automatic configuration, in which the configuration of POM import dependencies is shown in Fig. 2 [6].

3 Overall Design

Personalized teaching system is designed based on B/S architecture and adopts the idea of hierarchical design, which is mainly divided into three layers: user UI layer, business layer and data layer. First of all, the UI layer is mainly used to manage the interactive functions between users and the system. The business layer needs to analyze and calculate the user information and behavior data of the system and establish the corresponding model of collaborative filtering recommendation algorithm. The data layer is the functional support of the system's data storage service, so it is necessary to save the system's data to ensure its security and reliability [7].

4 Functional Implementation

This paper adopts the recommendation algorithm based on items in collaborative filtering algorithm. First, it is necessary to construct a co-occurrence matrix of different video courses to calculate the similarity between video courses, and calculate other teaching videos that are most suitable for the student users according to the history records of watching courses. The calculation formula of similarity between items is shown in formula (1), i and j in the formula represent course i and course j , so the meaning of $N(i)$ is the number of students who like course i . [8]

$$W_{ij} = \frac{|N(i) \cap N(j)|}{\sqrt{N(i) \cdot N(j)}} \quad (1)$$

The calculation formula for calculating the interest degree of a certain user u in a certain video course j is shown in formula (2). Where $N(u)$ represents the collection of video courses that student user u likes, and $S(j, k)$ represents the collection of k videos similar

Table 1. Results of the collaborative filtering algorithm

Video course	a	b	c	d	e
a	-	0.41	0.68	0	0
b	0.67	-	0.58	0.71	0.58
c	0.58	0.71	-	0.67	0.58
d	0	0.41	0.58	-	0.68
e	0.58	0.58	0.71	0	-

to video course j.

$$P_{uj} = \sum_{i \in N(u) \cap S(j,k)} W_{ij} r_{ui} \quad (2)$$

Take student user A as an example, knowing that his favorite video courses are a, b and c, it is necessary to predict the user's liking for courses d and e. The results of collaborative filtering algorithm calculated according to existing data are shown in Table 1 [9].

As shown in Table 1, we can calculate the prediction of course videos D and E as follows: $d = 0.99$ and $e = 1.87$. According to the results, it can be seen that the student user A likes the course video e to 1.87, so the course video e can be recommended to user A [10].

5 Conclusion

This paper studies the design and construction of personalized recommendation teaching system based on artificial intelligence, realizes the function of personalized recommendation of teaching resources for students, and can effectively improve students' online classroom learning efficiency. However, due to my limited ability and time, there are still many shortcomings in this study, which need further optimization and improvement by professionals. As for recommendation algorithms, this paper only studies collaborative filtering algorithm, but fails to consider the diversity of recommendation algorithms. It is hoped that we can try to add recommendation algorithms that analyze users' click behaviors and ratings in the future to achieve the goal of highly personalized recommendation system.

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References

1. Gao Fengyi, Wei Qiuyi, Ge Suhui. Research on Adaptive Learning Recommendation Algorithm of Vocational Education under Artificial Intelligence Background. *China Computer & Communication*.2022.05.
2. Shen Kaixuan. Design and Implementation of Personalized Recommendation System for Teaching Resources. Hebei University of Science & Technology.2019.05.
3. Niu Wenhui. Practice of Intelligence Education in Personalized Teaching. *Electronic Technique*.2021.11.
4. Yao Jinyang, Shan Zheng, Liu Fudong. Blended Teaching Mode of Operating System Course with Personalized Recommendation. *Computer Education*.2022.04.
5. Kang Jiahui. Personalized Recommendation Based on Teaching Optimization Algorithm. Huaibei Normal University.2021.06.
6. Kang Wanjun. Spark-based Personalized Recommendation Method of Online Teaching Resources. *Scientific and Technological Innovation*.2019.06.
7. Zhang Yuqing. Research and Implementation of Online Teaching System Based on Personalized Recommendation. Anhui Jianzhu University.2021.06.
8. Li Jiahua. Information Personalized Recommendation Algorithm of Cross-border E-commerce Shopping Guide Platform of Artificial Intelligence Based on Big Data. *Science Technology and Engineering*.2019,19(14): 280-285.
9. Xia Qiming, Liu Xiaoqiang. Design and Implementation of AI Algorithm Visualization Assisted Teaching System. *Computer Knowledge and Technology*.2020.05.
10. Wang Xiaoqing, Su Feng, Cai Chuangen. Intelligent Recommendation Algorithm of Film and Television Based on Data Mining Technology. *Modern Electronic Technology*, 2021, 44(11): 98-101.

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