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The Growth of Contemporary Music Subject and the Reform of Music Teaching in Universities

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ABSTRACT

In order to promote the growth of contemporary music and the reform of music, this article designs an improved collaborative filtering (CF) algorithm to solve the problem of sparse matrix in traditional recommendation algorithms. The data matrix is dimensionally reduced to find the nearest neighbor, so as to realize personalized recommendation of music teaching resources in colleges and universities. The test results show that the accuracy of the proposed teaching resource recommendation algorithm is improved by 22.56% compared with the traditional CF algorithm. The improved CF algorithm can provide more accurate prediction, and the recommendation effect of the improved algorithm is better than the original algorithm, which can effectively avoid the sparse matrix problem faced by the CF algorithm, and provide technical support for the development of contemporary music discipline and the reform of music discipline.

KEYWORDS

Collaborative filtering, Individuation recommendation, Music teaching, Teaching reform

INTRODUCTION

Music teaching in universities is very important for students majoring in music. The quality of its teaching will directly affect students' professional abilities and even affect their future employment (Jackson & Liggett, 2020). Music is a very important art subject, which has a significant influence on the cultivation of students' artistic and moral concepts. Therefore, music teaching has become an important topic in tertiary education (Mai et al., 2022). In recent years, universities have set up music elective courses for non-music majors and also created a group of high-quality music teachers, which has contributed to the growth of music teaching (Costa et al., 2017). Music reform in universities can effectively improve the instructional level, combine new science and technology, promote the growth of the music discipline, and make the music discipline itself change positively. At the same time, it can optimize teaching methods, enhance students' initiative in learning, and strengthen the effectiveness of music teaching (Meng, 2019). With the further popularization of internet technology, people can swim in the ocean of information anytime and anywhere. The quantity of information

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is no longer a problem, and how to obtain effective information conveniently and quickly, and even get individuation information service, has increasingly become the focus of research in all walks of life (He et al., 2021).

The establishment of a music major is conducive to improving the standard of campus culture in universities, improving the standard of running schools and education, and cultivating popular music talents (Xiaofeng, 2021). With the surge of information on the internet, information search technology is facing more and more challenges (Schlaseman, 2019). It is difficult for traditional search engines to meet the individuation needs of users, and it is increasingly difficult for people to find the resources they need accurately and quickly. To address this problem, so recommendation technology came into being. As an integral part of educational informatization, instructional resources reflect important significance in teaching (Ruiz et al., 2021). The online instructional platform contains a large quantity of instructional resources, but it usually provides users with the same resources (Yuan, 2021). Because users have different interests and hobbies, the demand for instructional resources is also different (Gong et al., 2018).

Traditional social recommendation systems cannot improve user satisfaction without clear requirements (Sato & Chen, 2021). Personalized recommendation technology can solve information overload. By uploading a series of actions to a user, it creates a separate model for each user and recommends the user's preferred content (Yancey, 2019). For example, the "recommended song list" of various music platforms uses this technology to mine and recommend songs that customers like, which saves users time. Aiming at the sparsity of traditional recommendation algorithms, an improved collaborative filtering (CF) algorithm is designed. In this paper, the authors combine the actual situation and mine the large amount of data generated in online music education to obtain useful information and realize personalized recommendations for music teaching resources in colleges and universities. For the sparsity of the traditional recommendation algorithm, an improved CF algorithm is designed to improve the recommendation quality by focusing on the processing of noise points while ensuring the recommendation efficiency. It provides references for the reform of contemporary music discipline growth.

RELATED WORK

He et al. (2021) believe that in individuation learning recommendation, both the direct goal represented by knowledge matching needs to be optimized and the indirect factors represented by learning experience need to be weighed. Noorashid and McLellan (2018) think that information education refers to a set of education systems covering business, technology, and data architecture by correctly analyzing the relationship between data and mining useful information from structured, semi-structured, and unstructured education data with different structures. In the work of Ma and Ding (2022) timbre, tone spectrum, and music beat are mainly used as feature sets to describe national music, and their functions and the performance of classifiers are analyzed and compared. Arantes et al. (2018) think that identifying the musical instruments used for playing from a given music signal is a problem worth discussing. Such a task may be very easy for people, but it is very difficult for machines. Traditional CF technology requires users to provide explicit scores to produce recommendation results, which increases the burden on users (Noorashid & McLellan, 2018). Therefore, many researchers propose that users' implicit scores obtained through data mining technology can be used to make recommendations. Lockhart et al. (2017) have done a lot of research on the classification of folk music genres by using the relevant characteristics of music rhythm, the Bayesian classifier, and a self-organizing clustering method. They also analyzed the influence of parameter adjustment and choice on the classification performance. Wang (2021) believes that individuation recommendation of instructional resources refers to recommending the most interesting instructional resources to educators and learners according to their interests, preferences, stable discipline, novel innovation, and phased learning characteristics. Wang (2021) pointed out that at present, education is in the era of big

data, and educators must be able to find data keenly, fully mine data, make real and reasonable use of data, and provide individuation services to customers. Yuan (2020) integrates and analyzes students' daily behavior data by using data mining technology, clusters students with different consumption behavior characteristics by using an optimized K-means algorithm, and then analyzes the correlation degree of learning behavior by using an association rule algorithm. Some scholars have combined CF and user feature tags to increase user viscosity and implemented distributed offline computing on the Hadoop platform to overcome recommendation singleness. However, these scholars did not perform corresponding processing on noise points.

In the stage of educational informatization, problems such as teaching mode, teaching efficiency, and sharing of instructional resources have been well solved, but there are still some problems. In school, every student is educated in the same way, the educational materials they use are the same, and even the exercises they are assigned are the same, although teachers have made great changes in novelty and diversity. However, their attitude towards each student is the same, and all teaching contents are based on unified standards, regardless of each student's hobbies, characteristics, or needs.

Musicology, as an artistic expression, embodies all aspects of social development and the presentation of a musical work is more a summary of people's lives (Khtere & Yousef, 2021). From a social point of view, the future growth of music teaching needs to follow the trends of the times. In this wave of development, the relationship between contemporary music disciplines and music teaching reform is interdependent. Any form of music teaching always has specific teaching objectives and tasks. For different teaching objectives, different styles, and different versions of musical works, it is not enough to rely solely on the music materials provided by textbooks. We need to find these resources on the internet and the richness of music resources can fully meet our teaching. At present, the purpose of music teaching is to cultivate real music culture communicators. Faced with this requirement, they should not only master professional music theory knowledge skillfully but also have a high degree of music culture literacy. From the analysis of the future development direction of music in universities, it is very common to attach importance to skills and despise culture in music teaching, which is inconsistent with the future development direction of music.

The purpose of teaching is not only to cultivate high-skilled professional music talents but also to have comprehensive music literacy. For music teaching, we can find the latest theoretical teaching ideas through the internet, such as the combination of basic music theory and solfeggio, the combination of music history and music appreciation, and the latest academic trends, such as the ups and downs of melody minor scales and how to judge the mode. These teaching ideas and academic achievements are not found in relatively solidified textbooks, but the network provides educators with the latest resources in this field. Adding these resources to teaching will make music teaching more in-depth and forward-looking. In the future growth of the music discipline at universities, the traditional concept of teaching skills needs to be changed. Music skills and music culture should be combined to obtain better development. This combined focus on skills and culture should be the ultimate goal of music teaching.

METHODOLOGY

Review of Traditional CF Algorithms

The basic CF algorithm is a common recommendation algorithm, whose core idea is to make recommendations based on the similarity between users and items.

Basic CF algorithms can be divided into two types:

1. User-based CF finds other users with similar preferences as the target user based on their rating history of items and uses the rating information of these similar users to predict the target user's preference for items they have not yet rated.

2. Item-based CF predicts the target user's preference for items they have not yet rated by analyzing the similarity between items and aggregating the user's ratings of similar items.

The advantage of the basic CF algorithm is that it is simple and easy to implement while being suitable for sparse data. However, it also has some limitations:

- **Cold start problem**: When users are new to the system or items are newly released, there is not enough historical data to calculate similarities, making it impossible to make accurate recommendations.
- **Data sparsity**: In large-scale recommender systems, rating data is often very sparse, which limits the discovery and prediction accuracy of similar users or similar items.
- **Algorithmic preference**: Similarity-based recommendations tend to fall into traditional preference circles, which do not explore the potential interests of users well.

To improve the recommendation quality, an improved CF algorithm is proposed.

Improved CF Individuation Recommendation Model

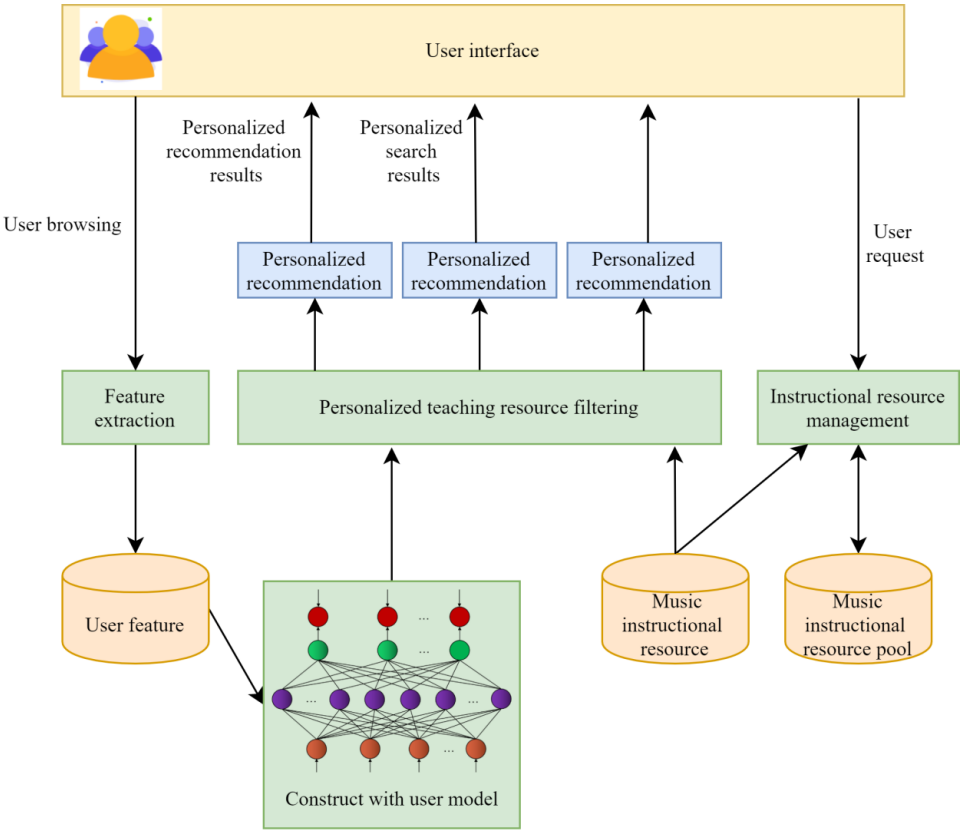
Personalized recommendation systems enable platform users to find the information they need in large-scale data. Personalized recommendations of music teaching resources in universities can improve students' satisfaction. The personalized recommendation system pushes the favorite song resources to users through relevant operations based on student collections. The CF algorithm calculates the similarity between target users and existing users, mining items of interest to similar users, predicting their ratings for items, and recommending highly rated music to target users. It mainly calculates the similarity of user behavior through cosine similarity.

The reform of music discipline and the growth of contemporary music discipline coexist. The reform of the music discipline should be carried out according to the growth of music subjects and aiming at various problems in current music teaching. With the continuous growth of music in China, the natural opportunities in the subject of music, such as the development and progress of music teaching, are constantly changing. On the other hand, the constant reform of the music discipline is also the cause of the formation of different music disciplines. The emergence of new music disciplines has enriched the content of music disciplines and put forward new requirements for music teaching. At present, university students are influenced by multiple sources of information and various ideological trends (Adnan, 2018). They generally have a strong sense of subjectivity, and they also advocate self-expression and individuality. From this, we can see that the growth of individuality is the inevitable result brought about by the evolution of the times (Fuchs, 2021). In a specific range, individuality and generality coexist; the characteristics of generality are often contained and embodied in individuality and individuality cannot exist alone without generality.

There is a certain contradiction between the existence and growth of individuality and generality. The reform of the music discipline and the growth of contemporary music disciplines are mutually influential, which determines that on the road of music teaching reform, the two must be interrelated and develop together. The resource retrieval model combined with the neural network algorithm is shown in Figure 1.

This method needs a training process. First, words are selected from the predefined thesaurus to describe the training document, and a classifier is created for each word. The new document will be processed by each classifier, and the words that are meaningful to the document will be given to the document. The input of the sentence understanding layer is each sentence matrix, that is, $S \in R^{N \times d_0}$. Local semantic understanding is performed at the sentence level every k words using wide convolution operations. The input statement is shown in Equation 1.

Figure 1. Resource retrieval model



$$s = \left\{w_1, w_2, \ldots, w_N\right\} \tag{1}$$

After the first layer of convolution operation, the hidden layer sequence can be obtained from Equation 2.

$$h^c = \left\{h_1^c, \ldots, h_{N+k-1}^c\right\} \tag{2}$$

Among them, each hidden layer element h_i^c is calculated using Equation 3.

$$h_i^c = \sigma\left(G \cdot \left[w_{i-k+1} \oplus \ldots \oplus w_i\right] + b\right) \tag{3}$$

Where $G \in R^{d \times kd_0}, b \in R^d$ is the parameter of the convolution operation and d is the dimension of the output vector. $\sigma\left(x\right)$ is the nonlinear activation function as shown in Equation 4.

$$\mathrm{Re}\,LU\left(x\right) = \max\left(0, x\right) \tag{4}$$

In Equation 4, $\oplus$ is a concatenation operation, that is, concatenating k word vectors into one vector.

The most fundamental characteristics of learning resources are learning and integrity. Learning means that learning resources should adapt to learners' psychological development and learning characteristics so that learning effects can reach the expected goals. In the field of education, individuality refers to influencing individuals and their various practical activities in promoting individuals to form relatively stable and lasting psychological characteristics in knowledge, skills, intelligence, and morality. Therefore, individualized teaching or training for students is to provide the most suitable education for each student on the premise of fully respecting individual differences from the individual development and actual learning needs of students (Fuchs, 2021).

The individuation retrieval module accepts the user's retrieval request, and the filtering function module overthinks the instructional resources according to the user model to form the individuation retrieval result. This module is composed of user personality information, personality learning, personality retrieval, query, result processing and feedback. The instructional resource feature library is formed by extracting the keyword features of each instructional resource in the traditional instructional resource library, which is a bridge connecting the user model and the instructional resources. The user's rating of instructional resource items can be regarded as an n-dimensional vector in the space, and the similarity between two users can be reflected by the cosine of the angle between the two vectors as shown in Equation 5.

$$sim\left(i,j\right)=\cos\left(\vec{i},\vec{j}\right)=\frac{\vec{i}\cdot\vec{j}}{\left\|\vec{i}\right\|\left\|\vec{j}\right\|} \tag{5}$$

Among them, the similarity $sim\left(u,v\right)$ of user i and user j is represented by the cosine of the angle between the vectors and $\left\|\vec{i}\right\|$ is the modulus of the i vector. The modified cosine similarity takes into account both user i and user j's set of rated instructional resource items as calculated in Equation 6.

$$sim\left(i,j\right)=\frac{\sum_{u\in U}\left(R_{u,i}-\bar{R}_i\right)\left(R_{u,j}-\bar{R}_j\right)}{\sqrt{\sum_{u\in U}\left(R_{u,i}-\bar{R}_i\right)^2}\sqrt{\sum_{k\in R_{mn}}\left(R_{u,j}-\bar{R}_j\right)^2}} \tag{6}$$

$R_{u,i}$ represents the score of the instructional resource item i by user u, and $\bar{R}_i$ represents the average score of the i-th instructional resource item. Equation 7 shows how to eliminate the effect of different user scoring habits by subtracting the average of user ratings.

$$sim\left(i,j\right)=\frac{\sum_{u\in U}\left(R_{u,i}-\bar{R}_u\right)\left(R_{u,j}-\bar{R}_u\right)}{\sqrt{\sum_{u\in U}\left(R_{u,i}-\bar{R}_u\right)^2}\sqrt{\sum_{k\in R_{mn}}\left(R_{u,j}-\bar{R}_u\right)^2}} \tag{7}$$

$\bar{R}_u$ is the average of the user's scores on all instructional resource items, and $R_{u,i}$ is the user u's score on the instructional resource item i.

There are not too many requirements for the original data types, and all kinds of data can be processed, including unstructured data. Under normal circumstances, computers cannot automatically

process unstructured data. The algorithm can get accurate results from complex data. For some complex content, it is not easy to express with specific values. Because other people's data is used to recommend the target user, the recommended result is probably irrelevant to the known preferences of the target user, but it is likely to be a potential interest point of the target user. Using CF technology in instructional resources can reduce learners' feedback information and increase the rate of individuation learning.

Individuation Recommendation of Music Instructional Resources in Universities

In music teaching, the concept of individuation teaching is different from the traditional unified and fixed mode of teaching. In the modern world, university students are mature in mental development and have mastered certain basic knowledge and skills, and the music discipline itself has the characteristics of openness. Therefore, the application of the individuation music teaching mode conforms to the growth law of university students and the need for talent development in the modern age. Learning style is determined by an individual's internal characteristics and external environment. Different individuals have different internal characteristics and encounter different external environments, so different learning styles will be formed. The learning methods adopted by learners to achieve their goals are influenced by their personality characteristics. Uniqueness shows individual learning differentiation and is the basis for realizing individuation learning. The system can analyze learners' behavior data, get their characteristics and interests, and provide individuation recommendations by using advanced IT.

Digitalization of music instructional resources is the growth and integration of resources. Professional teachers should participate in the collection and arrangement of instructional resources, find a new research direction in the collection and arrangement, and establish a new view of curriculum resources. To facilitate users' browsing, clustering technology is applied to the visual output of retrieval results. Clustering refers to dividing a document collection into several clusters. The individuation system of college music instructional resources is shown in Figure 2.

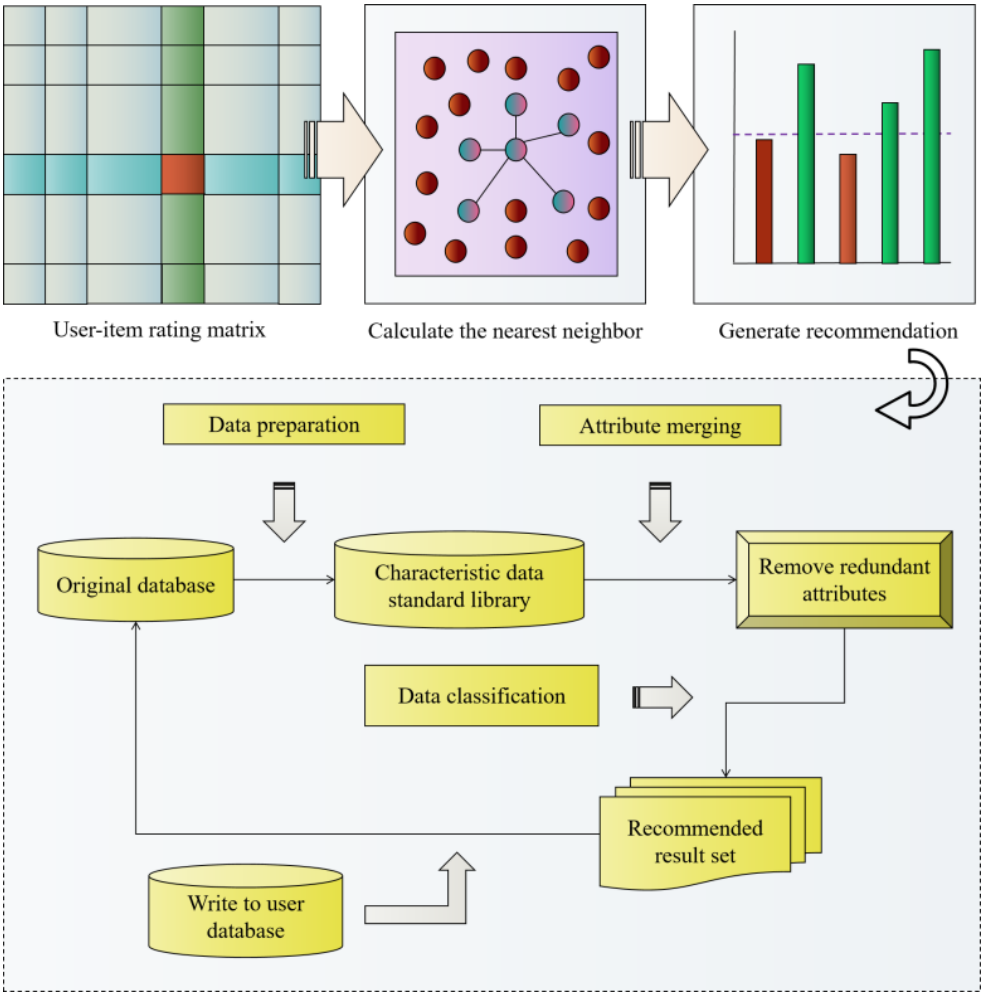
By obtaining and mining these data in real time, educators can be guided in a timely and targeted manner (Long, 2019). The main function of the individuation instructional resource service model is to learn and track users' individuation interests in the network instructional resource database system and filter instructional resources according to users' individuation interest characteristics.

When the quantity of users and items in the recommendation system increases, its computational burden will increase accordingly. When the amount of data is fixed, an efficient algorithm will produce an ideal recommendation effect with a small calculation cost, but when the data increases, not only will the calculation time increase but also the accuracy of the recommendation will be affected. Let the quantity of music contained in the music instructional resource library be N, the quantity of music containing keyword k_i in the music library be n_i, f_{ij} represents the quantity of times the keyword k_i appears in music d_j, and the word frequency d_j of TF_{ij} in music k_i is defined in Equation 8.

$$TF_{ij} = \frac{f_{ij}}{\max zf_{zj}} \tag{8}$$

Where z represents a keyword that appears in music d_j. The inverse frequency IDF of k_i appearing in the music library is defined as shown in Equation 9.

Figure 2. Personalized system of instructional resources in universities



$$IDF = \log\left(\frac{N}{n_i}\right) \tag{9}$$

Among them, n_i represents the quantity of musical works containing keywords in the music. The importance W_{ij} of the keyword k_i in the music d_j is defined in Equation 10.

$$W_{ij} = TF_{ij} * IDF \tag{10}$$

Assuming that the similarity between items S and U is calculated, the algorithm obtains the importance W_{ij} of the keyword k_i in the music d_j and then sorts the importance of all words in descending order to obtain the real keyword of the item.

Using the probability distribution of documents in different fields to express documents is characterized by avoiding accurate matching between documents, thus greatly improving the accuracy of the search. Similarly, the user interest model can be expressed by using the probability distribution of user interest in different fields.

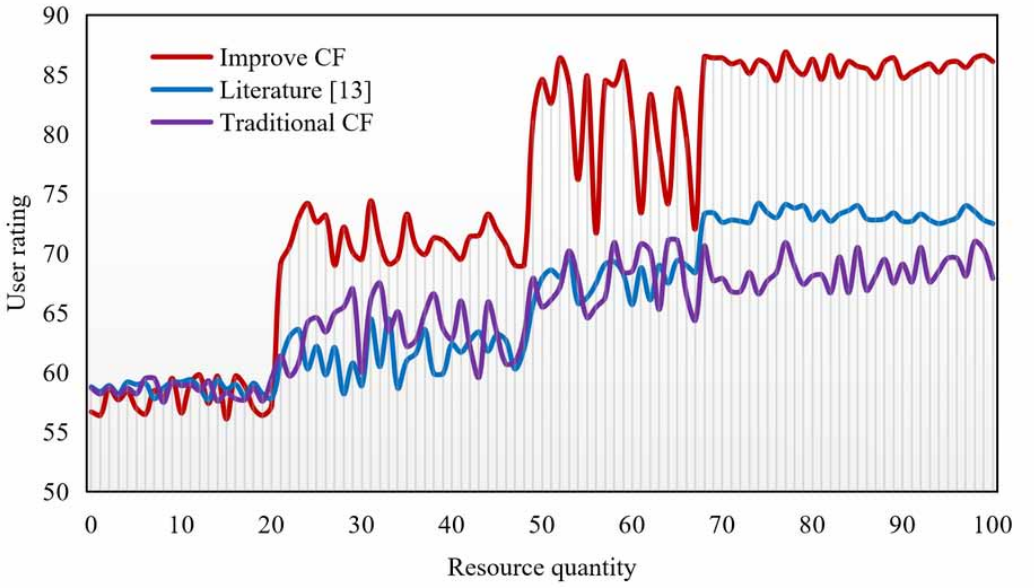
RESULT ANALYSIS AND DISCUSSION

User modeling plays an important role in the individuation recommendation model. User modeling mainly includes the acquisition and expression of user interests. A user model is a model that can reflect the characteristics and interests of users. Behavior data of educators and learners can be obtained through learning platforms, which can be analyzed and summarized, and a standard and computable teacher-student model can be obtained. Then, the teacher-student model can be dynamically fine-tuned with the increasing amount of data. User modeling is the foundation and core of individuation recommendation, and the user model is the main knowledge source of the individuation recommendation system. Whether a user model can capture users' real preferences to the greatest extent determines whether the recommendation is successful or not, and its quality is directly related to the quality of the individuation service. Therefore, only a systematic understanding of users' interest needs can provide users with satisfactory recommendations. Figure 3 shows the students' subjective rating results of the resources recommended by different instructional resource recommendation models.

As seen in Figure 3, students have a high degree of recognition for the recommendation system constructed in this article. When student users use the individuation service system for the first time, the system requires students to register their basic information and interested content; the system can also collect students' information implicitly.

Whether it is a single or mixed data collection method, it will face the quantity and quality problems of data collection to varying degrees. This problem will not only directly affect the accuracy and usability of the user model but also affect the normal operation of some individuation

Figure 3. Student's subjective score



recommendation algorithms that have special requirements for data quantity or quality in the project matching stage. The attention weight of each occurring behavior is calculated by using the representation of the sequence behavior and the previous hidden state. Then the sequence behavior characteristics are combined with the students' main intention characteristics to form an extended representation of each timestamp. When the input or output data values are too dense, the data points can be distanced. The results are shown in Figure 4 and Figure 5.

The initial population size is 15. User interests are expressed as a probability distribution on the domain classification model, i.e., a vector of conditional probabilities. When documents are recommended to users, the conditional probabilities corresponding to each classification in the vector can be modified according to the documents corresponding to user actions. The network connection weight is used to describe the connection between input and output. Compared with keyword list representation, neural network representation reflects the correlation between information. Because it relies too much on neural network types and algorithms in the stage of model learning, its application scope is narrow and difficult to understand.

For the prediction task based on sequence, the basic sequence encoder summarizes the behaviors produced by all students every week, while the attention-based sequence encoder can adaptively select relevant behaviors to capture the main intentions of students, which shifts focus to the recent actions of students. Using big data to accurately reveal the behavior habits of students and individuals and grasp the behavior characteristics of students can promote the combination of intelligent growth of the music discipline and individuation recommendation. Figure 6 shows the error of different resource recommendation models when different sparsity is selected.

Because of the limitation of the nearest neighbor clustering query itself (i.e., only the nearest neighbors of the target item are found in several clusters with the highest similarity to the target item), only most, but not all, of the neighbors of the target item can be found. Therefore, the recommendation accuracy of the recommendation system may be reduced. Comparing the instructional resource recommendation algorithm in this article with the traditional CF algorithm, the result is shown in Figure 7.

Figure 4. Convergence of initial group size training

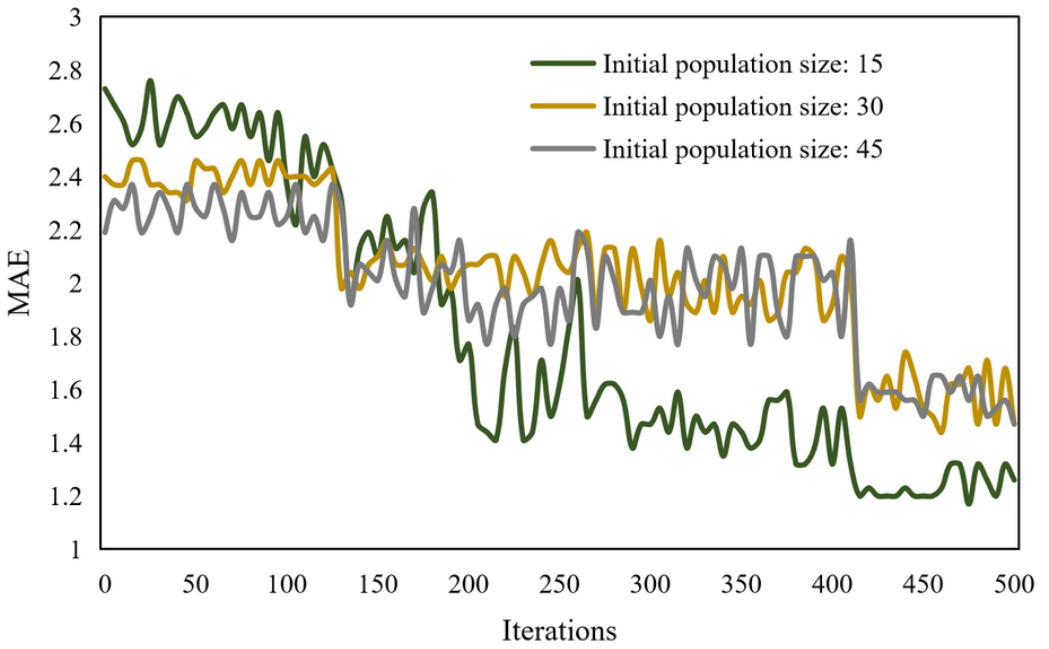


Figure 5. Initial population size training error

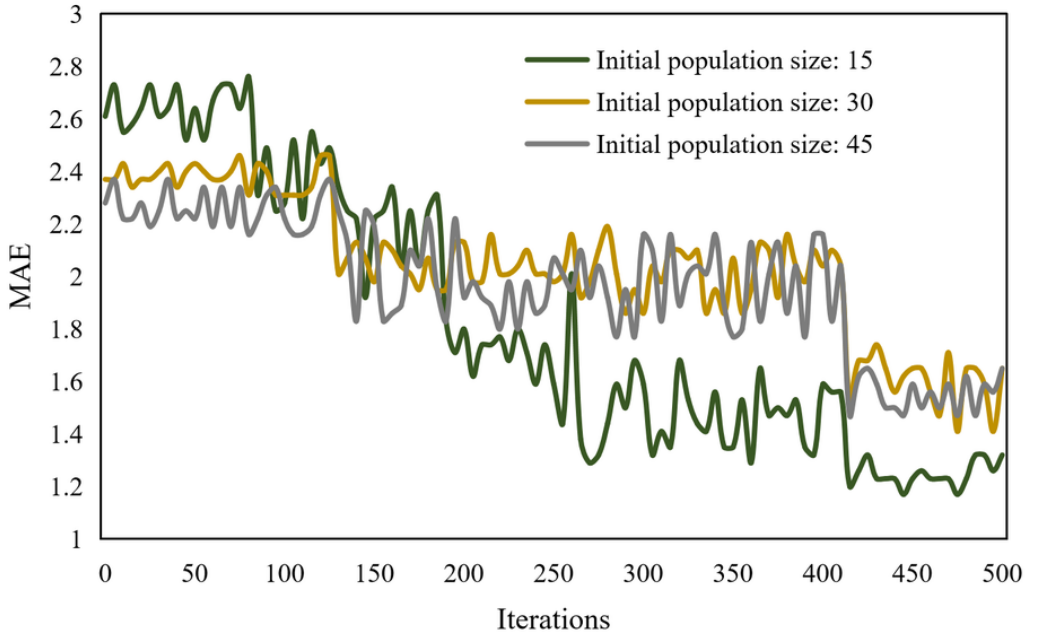
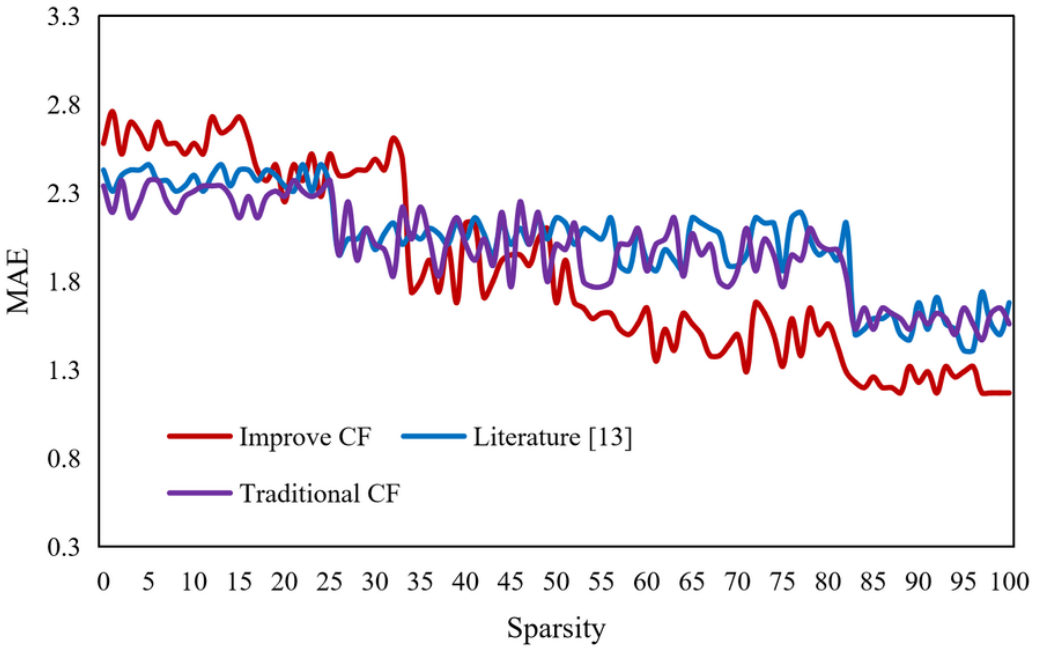
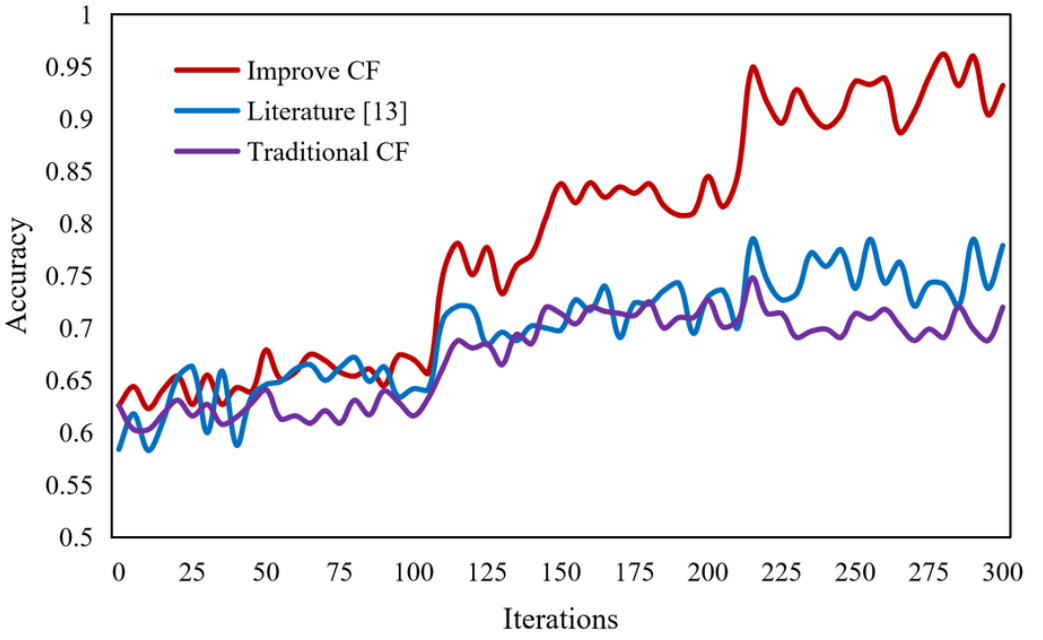


Figure 6. Error of different resource recommendation algorithms when different sparsity is selected



It is not difficult to find from Figure 7 that the accuracy of the instructional resource recommendation algorithm in this article is improved by 22.56% compared with the traditional recommendation method. The system adaptively modifies students' information and analyzes the

Figure 7. Comparison of evaluation accuracy



current students' behavior according to the information source of learning, to adjust the weight of students' interests or adjust the hierarchical structure of students' interests.

The system is composed of different modules. Each module processes the user's service request according to a certain algorithm and returns the corresponding processing result and execution status to the user. It communicates with the user layer up and the data layer down. The adaptive learning rate method is used in network training. The test results are shown in Table 1.

The recommendation model of music instructional resources in the basic text can avoid subjectivity and uncertainty in the stage of artificially selecting weights and correlation coefficients, and make the recommendation model more intelligent, adaptive, and available. The recommendation algorithm can browse online music instructional resources, track learners' status, provide learners with resources that they may be interested in to achieve the individuation recommendation effect, and improve learners' learning efficiency. The research results show that the improved CF recommendation model can effectively recommend curriculum resources for students and improve students' learning interests and learning efficiency. The records of students' activities in the network platform are tracked and collected by students' personal agents so the degree of students' interest in this resource can be inferred. By collecting the fields of students' interest, it is helpful to classify the contents that students are interested in. By analyzing the order of students' requests, it is easier to predict students' possible behaviors in the future and recommend appropriate information for students.

Table 1. Comparison of convergence

Learning rate	0.005	0.01	0.02	0.04	0.06	0.08	0.1
Training times	20	18	13	20	24	30	42
Error	6.5216	5.4368	9.8874	3.1156	7.3721	8.2233	3.4654

CONCLUSION

In school, every student is educated in the same way, the educational materials they use are the same, and even the exercises they are assigned are the same, although teachers have made great changes in novelty and diversity. Music is a very important art subject, which has a significant influence on the cultivation of students' artistic and moral concepts. Therefore, music teaching has become an important content in tertiary education. To promote the growth of contemporary music disciplines and the reform of the music discipline, this article designs an improved CF algorithm to solve the problem of a sparse matrix in traditional recommendation algorithms, and then finds the nearest neighbors, after dimensionality reduction of the data matrix, to realize individuation recommendation of music instructional resources in universities. The results show that the accuracy of the instructional resource recommendation algorithm in this article is improved by 22.56% compared with the traditional recommendation method. This model can avoid the subjectivity and uncertainty in the stage of selecting weights and correlation coefficients artificially, and make the recommendation model more intelligent, adaptive, and available. The recommendation algorithm can browse online music instructional resources, track learners' status, provide learners with resources that they may be interested in to achieve the individuation recommendation effect, and improve learners' learning efficiency.

In this article, the CF algorithm is improved to solve the problem of matrix sparsity, and the performance of the improved algorithm is improved to some extent. However, there are still some problems in the recommendation stage of the CF algorithm, such as cold start and scalability. In the future, it is necessary to study how to use unlabeled learning resources and consider the cold start and scalability of the recommendation algorithm, explore the unsupervised pre-training representation framework, and explore the implicit logic and knowledge relationship between learning resources.

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REFERENCES

Adnan, M. (2018). Professional development in the transition to online teaching: The voice of entrant online instructors. *ReCALL*, *30*(1), 88–111. doi:10.1017/S0958344017000106

Arantes, M., Arantes, J., & Ferreira, M. A. (2018). Tools and resources for neuroanatomy education: A systematic review. *BMC Medical Education*, *18*(1), 1–15. doi:10.1186/s12909-018-1210-6 PMID:29724217

Costa, E. B., Fonseca, B., Santana, M. A., de Araújo, F. F., & Rego, J. (2017). Evaluating the effectiveness of educational data mining techniques for early prediction of students' academic failure in introductory programming courses. *Computers in Human Behavior*, *73*, 247–256. doi:10.1016/j.chb.2017.01.047

Fuchs, K. (2021). The Online Teaching Survival Guide: Simple and Practical Pedagogical Tips. *American Journal of Qualitative Research*, *5*(1), 294–297. doi:10.29333/ajqr/10981

Gong, W., Tong, L., Huang, W., & Wang, S. (2018). The optimization of intelligent long-distance multimedia sports teaching system for IOT. *Cognitive Systems Research*, *52*, 678–684. doi:10.1016/j.cogsys.2018.08.005

He, Y., Ma, L., & Wang, Y. (2021). Research on collaborative governance mechanism of academic ecological environment under the background of crowd intellectual thinking. *International Journal of Crowd Science*, *5*(3), 271–280. doi:10.1108/IJCS-07-2021-0020

Jackson, D. J., & Liggett, L. (2020). Ethnic music and identity: Surveying polka DJs and IJs. *Polish American Studies*, *77*(2), 9–29. doi:10.5406/poliamerstud.77.2.0009

Khtere, A. R., & Yousef, A. M. F. (2021). The professionalism of online teaching in Arab Universities. *Journal of Educational Technology & Society*, *24*(3), 1–12. https://www.jstor.org/stable/27032852

Lockhart, B. J., Capurso, N. A., Chase, I., Arbuckle, M. R., Travis, M. J., Eisen, J., & Ross, D. A. (2017). The use of a small private online course to allow educators to share teaching resources across diverse sites: The future of psychiatric case conferences? *Academic Psychiatry*, *41*(1), 81–85. doi:10.1007/s40596-015-0460-4 PMID:26620806

Long, Y. (2019). Research on art innovation teaching platform based on data mining algorithm. *Cluster Computing*, *22*(S6, Suppl 6), 14943–14949. doi:10.1007/s10586-018-2461-z

Ma, H., & Ding, A. (2022). Construction and implementation of a college talent cultivation system under deep learning and data mining algorithms. *The Journal of Supercomputing*, *78*(4), 5681–5696. doi:10.1007/s11227-021-04036-4

Mai, T. T., Bezbradica, M., & Crane, M. (2022). Learning behaviours data in programming education: Community analysis and outcome prediction with cleaned data. *Future Generation Computer Systems*, *127*, 42–55. doi:10.1016/j.future.2021.08.026

Meng, M. (2019). The integration of multicultural music education in college music teaching. *Advances in Higher Education, 3*(4), 40–44. https://www.doi.org/10.18686/ahe.v3i4.1527

Noorashid, N., & McLellan, J. (2018). Teaching and learning an ethnic minority language at university level: The case of Dusun in Brunei. *GEMA Online Journal of Language Studies*, *18*(1), 217–233. doi:10.17576/gema-2018-1801-13

Ruiz, S., Rebuschat, P., & Meurers, D. (2021). The effects of working memory and declarative memory on instructed second language vocabulary learning: Insights from intelligent CALL. *Language Teaching Research*, *25*(4), 510–539. doi:10.1177/1362168819872859

Sato, E., & Chen, J. C. (2021). Rise to the occasion: The trajectory of a novice Japanese teacher's first online teaching through action research. *Language Teaching Research*, *25*(2), 306–329. doi:10.1177/1362168819846794

Schlaseman, S. (2019). Sound isolation among music teaching studios with glass curtainwall system. *The Journal of the Acoustical Society of America*, *146*(4), 2852–2852. doi:10.1121/1.5136895

Wang, R. (2021). Exploration of data mining algorithms of an online learning behaviour log based on cloud computing. *International Journal of Continuing Engineering Education and Lifelong Learning*, *31*(3), 371–380. doi:10.1504/IJCEELL.2021.116033

Xiaofeng, D. (2020). Application of deep learning and artificial intelligence algorithm in multimedia music teaching. *Journal of Intelligent & Fuzzy Systems, 38*(6), 7241–7251. 10.3233/JIFS-179800

Yancey, N. R. (2019). Collaboration in teaching-learning: Honoring the wisdom of diverse perspectives. *Nursing Science Quarterly*, *32*(4), 278–282. doi:10.1177/0894318419864329 PMID:31514611

Yuan, Q. (2020). Network education recommendation and teaching resource sharing based on improved neural network. *Journal of Intelligent & Fuzzy Systems, 39*(4), 5511–5520. https://doi.org/10.3233/

Yuan, Z. (2021). Interactive intelligent teaching and automatic composition scoring system based on linear regression machine learning algorithm. *Journal of Intelligent & Fuzzy Systems, 40*(2), 2069–2081. 10.3233/JIFS-189208

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