

Retraction

Retracted: Music Intelligent Push Play and Data Analysis System Based on 5G Internet of Things

Mathematical Problems in Engineering

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

- (1) Discrepancies in scope
- (2) Discrepancies in the description of the research reported
- (3) Discrepancies between the availability of data and the research described
- (4) Inappropriate citations
- (5) Incoherent, meaningless and/or irrelevant content included in the article
- (6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

- [1] C. Chen, T. Huang, J. Huang, C. Shih, and Y. Du, "Music Intelligent Push Play and Data Analysis System Based on 5G Internet of Things," *Mathematical Problems in Engineering*, vol. 2021, Article ID 6670534, 11 pages, 2021.

Research Article

Music Intelligent Push Play and Data Analysis System Based on 5G Internet of Things

Cheng Chen,¹ Tien-Shou Huang,² Jui-Chan Huang ,¹ Chi-Hung Shih ,² and Yun Du¹

¹Yango University, Fuzhou 350015, China

²Department of Intelligent Commerce, National Kaohsiung University of Science and Technology, Kaohsiung City 80778, Taiwan

Correspondence should be addressed to Chi-Hung Shih; ii08159110@nkust.edu.tw

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With the rapid development of information science today, multifunctional and intelligent applications have gradually become the focus of attention. In the data management system, the first consideration is the reliability of the data source, followed by the intelligent processing after the data are collected. Due to the upgrade of the Internet to the Internet of Things, the way of network information transmission has also become a problem that people need to think about. The transmission mode of network information services will be converted from the passive transmission of information by traditional servers to the form of actively pushing information. The application of intelligent push technology in the field of the Internet of Things is a prominent and important direction in the development of the Internet of Things. This article mainly introduces the research on the intelligent music push and data analysis system based on the 5G Internet of Things, with the intention of providing some ideas and directions for the research of the music intelligent push and play and data analysis system. This paper proposes a research method for music intelligent push playback and data analysis system based on 5G Internet of Things, including current intelligent push related technologies, music evaluation matrix, user dissimilarity matrix, and music feature similarity calculation. The experimental results in this paper show that with the increase in the number of users, the accuracy of the recommended results of the system under the Hadoop framework gradually stabilizes, eventually reaching 91.2%.

1. Introduction

With the development of information science and technology, rapid mining of required information has become a research hotspot. Recommendation systems have emerged from this, and information mining in a big data environment has become a research hotspot. Existing recommendations are often calculated offline, and the recommendation results are updated regularly. The real-time performance is not enough, and the recommendation system generally has cold-start and data-sparse problems. In the era of rapid development of information, how to quickly and accurately respond to user needs is a problem that needs to be solved urgently. The stand-alone mode requires a lot of time to iteratively calculate the recommendation algorithm, which is difficult to meet today's business needs.

In reality, due to the variability of music platform user interest preferences and the timeliness of information [1], it is necessary to use user behavior records to make timely

recommendations to users, that is, online processing of streaming data is a necessary condition for real-time music recommendation systems. For this reason, most of the recommended algorithms use parallel computing solutions. At present, distributed computing frameworks are emerging endlessly, and computing models are also diverse, each with its own advantages [2]. The most widely used frameworks are Hadoop and Spark. Big data computing modes are mainly divided into batch computing, streaming computing, interactive computing, and graph computing. The two big data processing methods are suitable for different application scenarios [3].

El-Latif A has studied the basic communication technology used by 5G networks to connect objects in the Internet of Things environment. With the development of 5G-IoT and the development of innovative technologies, it will surely bring new huge security and privacy challenges. El-Latif A uses the characteristics of quantum roaming to

construct a new *S*-box method, which plays an important role in the block cipher technology of 5G-IoT technology. As an application of the proposed *S*-box mechanism and controlled alternate quantum walk (CAQW) for 5G-IoT technology, a new robust video encryption mechanism is proposed. In addition to meeting the encryption requirements of various files in 5G-IoT, El-Latif A also uses the function of quantum roaming to design a novel encryption technology for the secure transmission of sensitive files in the 5G-IoT paradigm. The analysis and results of the cryptographic system show that, in terms of cryptographic performance, it has better security and effectiveness. The high cost of this research is not conducive to popularization [4]. Palattella believes that the Internet of Things is expected to be based on the seamless interaction between a large number of 5G devices, through a large number of new services to completely change the way people live and work. After decades of the creation of the Internet of Things concept, various communication technologies have gradually emerged in recent years, reflecting the diversity of application fields and communication requirements [5]. With the popularization of connection technologies and the emergence of 5G cellular systems, this technology become a potential key driver of the yet-to-be-emerging global Internet of Things. In the research, Palattella analyzed in detail the potential of 5G technology in the Internet of Things by considering technology and standardization, reviewed the current IoT connection pattern and the main 5G support factors of IoT, and explained the possibility of a close connection between the Internet of Things and 5G Huge business changes caused in the operator and supplier ecosystem. This research method lacks experimental data support [6]. Akpakwu believes that the Internet of Things (IoT) is a promising technology that tends to completely change and connect the global world through seamless connections based on heterogeneous smart devices [7]. The current demand for machine-type communication has led to multiple communication technologies with multiple service requirements to realize the modern IoT vision. The latest cellular standards such as long-term evolution have been introduced for mobile devices, but they are not suitable for low power consumption and low data rate devices such as IoT devices. Akpakwu found that the fifth-generation (5G) mobile network is expected to solve the limitations of previous cellular network standards and become a potential key enabler of the future Internet of Things. Akpakwu investigated the latest IoT application requirements and related communication technologies and discussed in detail a cellular-based low-power wide-area (LPWA) solution based on the Third Generation Partnership Project (3GPP) to support and enable targeted new service requirements for key IoT use cases for large-scale IoT, including an expanded global mobile communication system for the Internet of Things (EC-GSM-IoT), enhanced machine type communication (eMTC) and narrowband Internet of Things (NB-IoT). Akpakwu presented a comprehensive overview related to emerging technologies and enabling technologies, mainly focusing

on 5G mobile networks, aiming to support the realization of IoT-based intelligent push systems. This study lacks examples to prove that, it is not practical [8].

The innovations of this paper are (1) proposed a music evaluation matrix; (2) proposed a user dissimilarity matrix; (3) proposed a music feature similarity calculation; (4) designed a music intelligence based on 5G Internet of Things push playback and data analysis system.

2. Method of Music Intelligent Push Playback and Data Analysis System Based on 5G Internet of Things

2.1. Related Technology

2.1.1. Hadoop Framework. The Hadoop framework is an open-source distributed basic framework developed by Apache. The two core designs are the distributed programming model MapReduce and the distributed file system HDFS (Hadoop distributed file system) [9]. The main advantage of Hadoop is its high efficiency. Hadoop's parallel working method can speed up data processing, can complete the processing of large amounts of data in an acceptable time, and has strong scalability. It is proportional; simplicity, for the use of Hadoop, can be realized by writing Map interface and Reduce interface, so that it can realize distributed operation without knowing the specific implementation details of the underlying layer, reliability, flexibility, and Hadoop. There is no mandatory requirement for data format, unlike relational databases, which require very strict data format; economical [10, 11].

2.1.2. MapReduce. MapReduce is a programming model of a distributed system. Users can complete simple distributed calculations without understanding the basic implementation of the underlying, which reduces the difficulty of distributed calculations [12]. A task generally consists of two parts: the Map phase and the Reduce phase. Among them, the main task of the Map phase is to split the input data file to generate a series of (key and value) key-value pairs, and then, the Reduce phase will merge the key-value pairs of the same key to form the final. As a result (key, final_(value)), the whole process is connected by setting the key value [13]. During the execution of MapReduce, multiple Map phases can be included, and multiple Reduce phases can also be included.

2.1.3. HDFS. The architecture of the HDFS system adopts a master-slave structure, which is generally composed of three parts, namely, a client, a name node, and multiple data nodes. Among them, the name node is the HDFS system administrator, mainly responsible for the meta information of directories and files. For a folder, the information it contains is mainly modification and access time, block size, access permission, and the constituent blocks of a file; for a directory, the main information is access permission, quota metadata, and modification time [14]. The data node is the file storage unit of HDFS. It mainly manages the verification

information and content information in the data block. When the data node is added to the cluster, the name node will establish a block mapping relationship based on the data block list generated by the data node. When the data node is running, the information in its own data block will be reported to the name node regularly to ensure that the block mapping is up-to-date. The client accesses HDFS by communicating with name node and data node to realize file operations [15].

2.1.4. JSON. JSON is a format for data exchange. Data are stored and transmitted in JSON format, which makes it easier for developers to read and encode [16].

2.2. Music Evaluation Matrix. In general, users will only appreciate a small part of the music in the website according to their personal preferences, so the music evaluation matrix R is a sparse matrix [17]. A large amount of sparse data will cause serious distortion of the mining results. Generally, discrete wavelet transform (DWT), principal component analysis, and other methods are used to reduce dimensionality, and representative data are extracted for mining processing [18, 19]. Compared with wavelet transform, the principal component analysis method can better deal with sparse data, while wavelet transform is more suitable for processing high-dimensional data. Principal component analysis is also called statistical-based principal component analysis. A method of dimensionality reduction processing. This method searches for KN -dimensional orthogonal vectors $K \leq N$ that best represent the data and projects the original data into a smaller vector space so that the data can be dimensionally reduced [20]. The calculation process is as follows:

Calculate the correlation coefficient matrix $R_{n \times n}$ of user evaluation matrix A for music according to the following formula:

$$r_{ij} = \frac{\sum_{k=1}^n (X_{ki} - \bar{X}_i)(X_{kj} - \bar{X}_j)}{\sqrt{\sum_{k=1}^n (X_{ki} - \bar{X}_i)^2 \sum_{k=1}^n (X_{kj} - \bar{X}_j)^2}} \quad (1)$$

Calculate the contribution rate of principal components as follows:

$$Z_i = \frac{\lambda_i}{\sum_{k=1}^p \lambda_k}, \quad i = 1, 2, 3, \dots, p. \quad (2)$$

Cumulative contribution rate is calculated as follows:

$$\frac{\sum_{k=1}^m \lambda_k}{\sum_{k=1}^p \lambda_k}. \quad (3)$$

Calculate the principal component loading as follows:

$$p(Z_k, x_i) = \sqrt{\lambda_i} e_{ij} (i, j = 1, 2, 3, \dots, p). \quad (4)$$

2.3. User Dissimilarity Matrix. The user dissimilarity matrix $S = (s_{ij})_{m \times m}$ is generated from the evaluation matrix R . There are four methods for calculating the user dissimilarity as follows:

2.3.1. Euclidean Distance. Euclidean distance is used to calculate the distance between points $x = (x_1, x_2, \dots, x_n)$ and $y = (y_1, y_2, \dots, y_n)$ in space [21]. Here, the following formula is used to calculate the degree of dissimilarity between data:

$$\text{dist}(x, y) = \sqrt{\sum_{i=1}^n (x_i - y_i)^2}. \quad (5)$$

2.3.2. Manhattan Distance.

$$\text{dist}(i, j) = |x_{i_1} - x_{j_1}| + |x_{i_2} - x_{j_2}| + \dots + |x_{i_n} - x_{j_n}|. \quad (6)$$

2.3.3. Pearson Correlation Coefficient.

$$\text{sim}(x, y) = \frac{\text{COV}(x, y)}{\sigma_x \times \sigma_y}. \quad (7)$$

2.3.4. Cosine Similarity.

$$\text{sim}(x, y) = \frac{|(x, y)|}{\|x\|_2 \|y\|_2}. \quad (8)$$

2.4. Music Feature Similarity Calculation. Extract the features between music and perform feature similarity calculation [22]. Calculate the similarity between two variables and the formula is as follows:

$$p(x, y) = \frac{\sum x_i y_i - n \bar{x} \bar{y}}{(n-1)S_x S_y} = \frac{n \sum x_i y_i - \sum x_i \sum y_i}{\sqrt{n \sum x_i^2 - (\sum x_i)^2} \sqrt{n \sum y_i^2 - (\sum y_i)^2}} \quad (9)$$

Use Cosine coefficient to calculate document similarity and the formula is as follows:

$$T(x, y) = \frac{x \cdot y}{\|x\|^2 \times \|y\|^2} = \frac{\sum x_i y_i}{\sqrt{\sum x_i^2} \sqrt{\sum y_i^2}} \quad (10)$$

Use Jaccard coefficient (expansion of Cosine coefficient) to calculate document similarity, and the formula is as follows:

$$T(x, y) = \frac{x \cdot y}{\|x\|^2 \times \|y\|^2 - x \cdot y} = \frac{\sum x_i y_i}{\sqrt{\sum x_i^2} \sqrt{\sum y_i^2} - \sum x_i y_i}. \quad (11)$$

The Euclidean distance between any two points x and y in n -dimensional airborne is as follows:

$$d(x, y) = \sqrt{\sum (x_i - y_i)^2}. \quad (12)$$

When $n=2$, the space becomes a plane, and the Euclidean distance degenerates to the length of the line segment formed by two points on the plane [23]. In practical applications, the curve function formula is usually used for conversion: distance is inversely proportional to similarity, and the following formula exists:

$$\text{sim}(x, y) = \frac{1}{1 + d(x, y)}. \quad (13)$$

The method part of this article uses the above three algorithms to study the design method of the 5G Internet of Things-based music intelligent push playback and data analysis system. The specific process is shown in Figure 1.

3. Design of Music Intelligent Push Playback and Data Analysis System Based on 5G Internet of Things

3.1. Overall System Structure

3.1.1. System Structure. The system design adopts a multilayer structure; on the basis of the software architecture, each system forms a unified information platform of the Internet of Things information push system through the interactive connection between the servers, and at the same time reflects the user's operation information records and statistical data to the background management system [24].

(1) *Basic Environment.* The information push system provides the hardware environment and system software platform for system operation, including essential system software such as operating systems, servers, and databases [25].

(2) *Data Layer.* The data layer is located between the user service layer and the basic environment. It consists of a user push system, a background management system, and a statistical system data interaction platform. Among them, the application data of the back-end management system and the statistical system use relational databases. User behavior system: using text storage data [26, 27].

(3) *Data Exchange Platform.* It realizes the connection of information exchange and application integration of various application systems.

(4) *Service Layer.* It is composed of system basic components and provides standardized modules for the system [28].

(5) *Application Layer.* Adopting an integrated mechanism and customizing into a user behavior system, a background management system, a statistical analysis system, and a push

information system through user operations and administrators' operational requirements.

(6) *Presentation Layer.* It constitutes user login and information push and provides service system interface for system administrators and users.

(7) *Security System.* Security is an important principle of push system and website construction [29].

3.1.2. Overall System Design. The information push system is composed of four parts: user behavior system, background management system, statistical system, and information push system under the overall design framework [30].

(1) *User Behavior System.* The user behavior system provides a unified service window for users, provides an environment for user information registration and music playback and purchase so that all users provide a platform for music information viewing and music purchase.

(2) *Backstage Management System.* It is provided for the administrator to edit music information and audit users, edit with management authority, and provide advertising functions for the user behavior system [31].

(3) *Statistical System.* The system design adopts the model of document database and relational database, and the business system adopts relational database. The function of statistics based on the number of times the user plays music and the number of times purchased music. By recording the user's operation behavior on music information, each behavior will be recorded in a log, and then, the basic data in the log will be extracted with a shell script analysis and storage. Finally, the basic data are counted twice through the storage process and finally used as the basis for information push [32].

(4) *System Push System.* It provides users with information subscriptions, and administrators can send and query music information for specific user subscriptions. It also provides regular sending functions.

The overall process of the system is that the user's identity needs to be verified when the user logs in. If it is a task submitter, the task is submitted through the front desk according to the needs of the task, and the task type and task-related information are selected at the same time, such as: the user characteristics required for this task, the geographic location of the task trigger, and other information [33, 34]. After the task is submitted successfully, the scheduling system will maintain the smooth operation of the entire system and will select suitable tasks for triggering according to the set scheduling strategy. In the process of screening users, the black and white list will be activated and special personnel will be given a special deal. After the task is executed, the blacklist will be updated, and the task execution result will be fed back through the mail module. Finally, push messages to the screened personnel through push channels [35].

3.2. Feature Build Design. The construction of features mainly completes data cleaning, data merging, and data feature structuring.

3.2.1. Data Cleaning. Data cleaning is mainly to complete the wrong user information in the data, such as the user does not conform to the set structure and stores the wrong information. There is a large amount of user behavior information in the user's historical log information, but some of this information is deliberately modified by the user's own information through illegal means. This information does not meet the requirements of the push task, because for this type of information, even if the user characteristics excavated are very suitable for being a user because the user's identity is wrong, the push task to the user cannot be completed normally, so it is necessary to refresh the data. First, complete the cleaning of user data based on regular expressions. Secondly, it is also necessary to clean the historical log information that contains few information storage errors in the historical data.

3.2.2. Data Consolidation. The data after data cleaning are the redundancy of data information. The same user may exist in different log files, which is inconvenient for the development of data feature mining work. Therefore, data merging work needs to be completed. Data consolidation refers to the integration of the same user's information in the same file. First, integrate the user's basic information, retrieval information, and behavior information into the same file according to the user's identity and then integrate the user's push information and the user's feedback information after the push into the same file according to the push.

3.2.3. Structured Data Characteristics. After the data are merged, the data need to be structured. The process of structuring user information requires data fusion. For the data of the push content, the keywords of the text are found by segmenting the push text. For the keyword obtained by word segmentation, if the user clicks on the push message, it indicates that the user is more interested in the keyword; if the user does not click, it indicates that the user is not interested in the keyword. At the same time, a time factor is added to determine the changes in user interest. After obtaining the individual characteristics of the user, the individual characteristics are merged, and after the overall characteristics are obtained, the characteristics are judged offline by AUC. If the influence weight of the characteristic is less, the characteristic is deleted and the change of AUC is observed. For online, A/B test can be used for small flow tests to check the model effect.

3.3. Accurate Push. Precision push is divided into two parts, one is push based on the matching of basic user characteristics, and the other is push based on the logistic

regression training model. The push based on the user's basic characteristics matching mainly judges the pushed user based on some basic information of the user. When the user does not meet any of the conditions, the user does not meet the requirements of the push, and the user is abandoned. Because users of the Android and IOS operating systems need to be pushed separately, when the users are screened, the respective users need to be counted accordingly. The number of users that the task may require is the total number of Android and IOS users or the number of Android and IOS users. At the same time, the number of new users can be specified in the task. However, because the keyset by MapReduce is the user's identity account, and because the Android and IOS identity accounts have their own connectivity, when the Reduce hash output is performed, users of the same operating system are likely to be assigned to the same The output is performed in Reduce, so that when the operating system is distinguished between users when the number of user requirements is small, the filtered users will belong to the same operating system, which is contrary to the actual proportion of real users. The obtained results are scrambled, so as to avoid the selected users are all Android or IOS, resulting in an imbalance of users.

In order to solve the user "cold start" problem, in the early stage, for each user, there is no corresponding training data, choose to push the message based on the user's basic characteristics, when the data have accumulated to a certain extent, you can use the existing data for training. An LR model, so that in the end, users will be interested in this push score. In theory, users with a score greater than 0.6 points can be considered interested in this push task, and finally, the user will be evaluated based on the user score sort and then take out topN users to push this task.

This part of the experiment proposes that the above steps are used for the design of a 5G IoT-based music intelligent push playback and data analysis system. The specific process is shown in Table 1.

4. Music Intelligent Push Play and Data Analysis System Based on 5G Internet of Things

4.1. Music Intelligent Push and Play Platform. The Internet has become the most important way to spread music today. The competition among major online music companies in my country is fierce. Most companies have been established for more than 10 years, have a certain number of customers, and have formed their own service characteristics. In today's increasingly fierce competition in the online music market, companies are scrambling to find innovative business points to breakthrough business growth bottlenecks. The main online music platforms in my country are shown in Table 2 and Figure 2.

Observing the chart, we can see that NetEase Cloud Music, which was released the latest, has become the largest online music platform for users due to its intelligent push, personalized

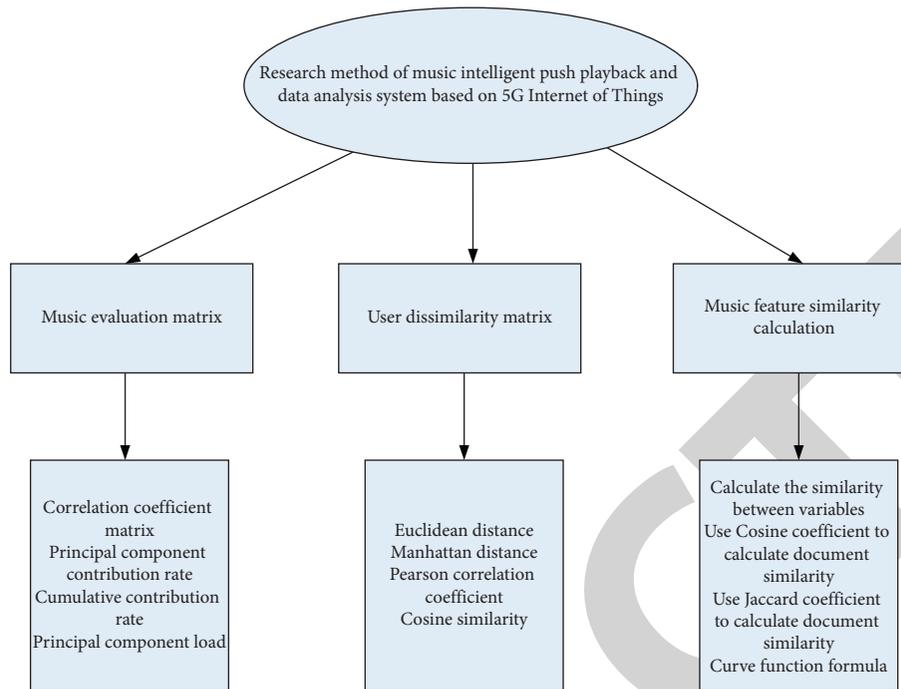


FIGURE 1: Part of the technical flow chart of this algorithm.

TABLE 1: The experimental procedure of this article.

Design of music intelligent push playback and data analysis system based on 5G Internet of Things	1	Overall system structure	1	Architecture
			2	Overall system design
	2	Feature build design	1	Data cleaning
			2	Data consolidation
			3	Structured data characteristics
	3	Accurate push	1	Push based on the matching of basic user characteristics
2			Push based on logistic regression training model	

interface, and other advantages. Most companies tend to attract users through special services, seize users, and occupy the market. How to develop characteristic products and attract users has become the most difficult problem in finding new business breakthroughs. Using 5G Internet of Things technology to realize the intelligent push of music will help the platform attract more users, increase daily activity, and further achieve profit growth.

4.2. User Analysis of Music Smart Push Platform

4.2.1. *User Distribution.* Through the CLIQUE algorithm, the clustering of enterprise users is realized, and then, based on the cluster, the important knowledge is obtained through the association rule algorithm to guide the decision-making level to implement different marketing strategies for different customer groups. Use the five attributes of music style, sound quality, song price, user occupation, user location, and language type to cluster and obtain relevant data for a certain period of time on the platform after preprocessing, as shown in Table 3.

The system should intelligently push high-quality music and focus on pure music and popular music, which can attract more users and they are willing to consume high-quality music. Young students and freelancers have basically maintained their preference for music, and their peers have basically maintained similar hobbies focused on popular music in various languages.

4.2.2. Online Usage of Users

- (1) Count the length of time users have used the online music platform and draw a chart, as shown in Table 4 and Figure 3.

It can be seen from the chart that Saturday and Sunday are the two days where users spend the most time online. The platform can set the number of smart pushes on Saturdays and Sundays to be more frequent and there are more types of pushes; the online use time of users on weekdays after Monday is relatively shorter, the platform can be set to accurately push according to users' likes.

TABLE 2: Major online music platforms in China.

Platform name	Release time (year)	User scale	Advantages
NetEase Cloud Music	2013	Over 800 million users	Social functions, smart push, and beautiful design
Kugou music	2006	Over 500 million users	The earliest digital music service and interactive platform
Kuwo music	2005	Over 100 million users	Many kinds of music
QQ music	2005	Over 400 million users	China's largest wireless music sales platform
Xiami music	2008	Over 500 million users	Rich in funds

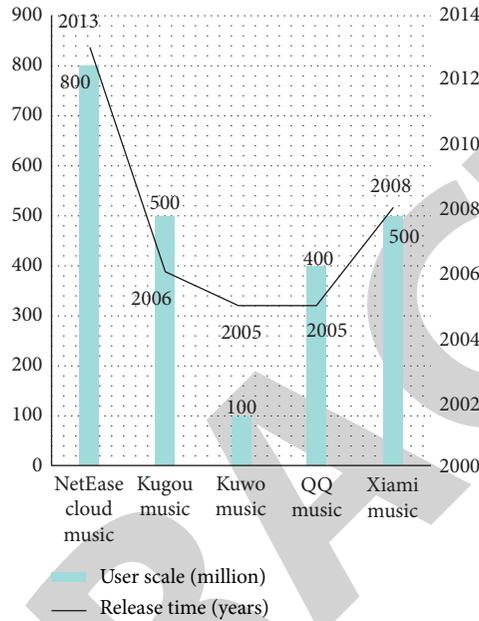


FIGURE 2: Major online music platforms in China.

TABLE 3: User distribution.

User	Favorite music style	Music language	Sound quality	Paid music budget (RMB)
Primary and secondary school students	Electronic music and pop music	Mandarin, English, Japanese, and Korean	Hi-Fi	10
College students	Pop music, rock music, and rap	Mandarin, English, Japanese, Korean, and Cantonese	Hi-Fi	15
Office worker	Lyric music, pure music, and pop music	Mandarin, English, and Cantonese	Hi-Fi	25
People engaged in art	Pure music and classical music	Mandarin, English, and Japanese	Hi-Fi	30

(2) Calculate the time period that users use the online music platform and draw a chart, as shown in Table 5 and Figure 4.

It can be seen from the chart that users often use online music platforms during commuting hours, lunch hours, and dinner hours. If you intelligently push related music to users during these time periods, you will be able to achieve a better push effect.

4.3. Comparative Experimental Analysis of Different Data Sets. In order to confirm the improvement effect of the improved method in the frequent set mining experiment, consider applying the improved method to different music data sets

and compare the improvement effect. Draw the specific situation into a chart, as shown in Table 6 and Figure 5.

As shown in the figure, the experimental results of the improved frequent itemset mining method under different data sets are recorded. Under the same support threshold, the frequent set mining effects of different data sets are basically similar. However, since users with fewer historical records are excluded in the process of selecting the data set, the number of frequent itemsets is increased to a certain extent.

4.4. Intelligent Push Accuracy Analysis. Count the related records of users' play, favorites, and purchases and draw them into a table, as shown in Table 7. Each row contains seven fields: user ID, song ID, number of listening times,

TABLE 4: User online usage time (unit: minute).

User	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Primary and secondary school students	45	39	41	44	43	121	109
College students	67	56	55	53	59	134	112
Office worker	59	55	47	62	66	197	201
People engaged in art	83	78	81	77	84	182	197

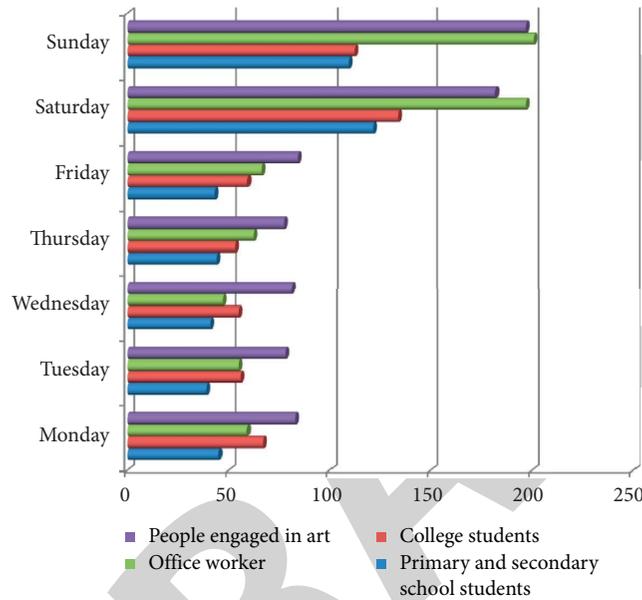


FIGURE 3: User online usage time (unit: minute).

TABLE 5: User play time period.

Period	Percentage (%)
0:00–6:00	4.7
6:00–9:00	7.3
9:00–12:00	14.6
12:00–15:00	19.4
15:00–18:00	18.7
18:00–21:00	25.1
21:00–24:00	10.2

switching times, favorites or purchases, timeline, and comments.

To test the processing performance of the method proposed in this paper, it takes a certain amount of time to prepare and start the platform under the Hadoop framework, and at the same time, the distributed computing itself also brings certain computational overhead. At this stage, five hundred users are tested and tested according to different algorithms, and the results are plotted as a graph, as shown in Figure 6.

According to the results in the figure, the recommendation method proposed in this paper has obvious advantages in comparing the accuracy of the recommendation results. When the user data reaches a certain level, the accuracy is usually higher than that of the traditional method. This method draws on and combines the recommendation ideas of the two basic methods, so regardless of the number of users, the performance is better than the traditional method. At the same time, with the increase in the number of users, the accuracy of the recommendation results of the

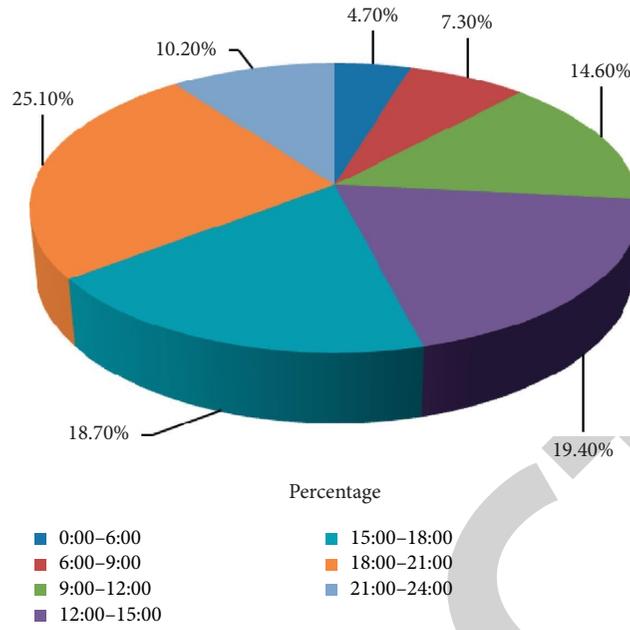


FIGURE 4: User play time period.

TABLE 6: Frequent set mining results under different data sets.

Data set	Support threshold				
	0.01	0.03	0.05	0.07	
us0	us0_Gender	108	36	22	7
	us0_Language	194	64	36	21
	us0_Releasedate	121	57	57	43
	user_songs_0	246	82	53	37
us2	us2_Gender	147	49	67	56
	us2_Language	363	121	63	49
	us2_Releasedate	246	147	132	114
	user_songs_2	337	113	101	81

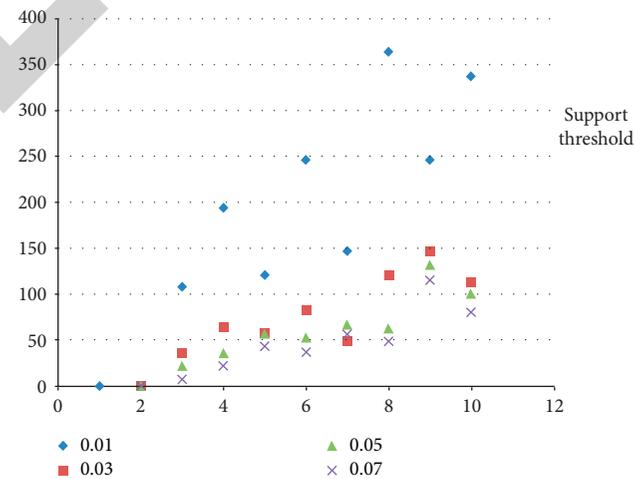


FIGURE 5: Frequent set mining results under different data sets.

TABLE 7: User behavior-contextual data display.

User id	Song id	L-times	C-times	Collect & buy	Timeline	Comment
A	37	7	1	YES	15:00–18:00	Like
B	41	4	2	YES	18:00–21:00	Like
C	132	6	1	YES	9:00–12:00	Like
D	47	8	3	NO	18:00–21:00	Dislike
E	58	5	3	NO	21:00–24:00	Dislike
F	61	6	2	YES	12:00–15:00	Like

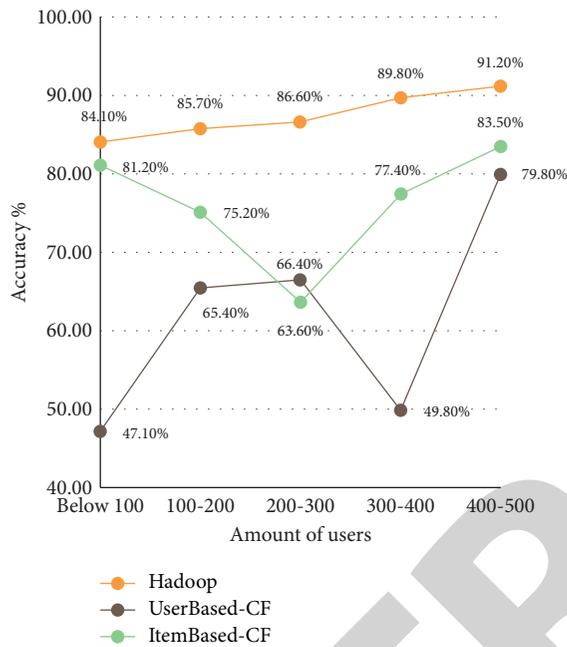


FIGURE 6: Test results of different algorithms.

system under the Hadoop framework gradually stabilized, eventually reaching 91.2%.

5. Conclusions

The Internet of Things technology is a comprehensive technology that connects objects to the Internet through communication equipment, sensors, data collection and processing systems, positioning systems, and other equipment according to a certain communication protocol. The intelligent monitoring, positioning, and management of objects can be realized through the Internet of Things. In recent years, due to a large amount of human and material resources investment, application systems based on the Internet of Things technology have also been continuously developed and improved. The use of the Internet of Things technology to achieve intelligent music push and play and data analysis systems has become a new technology.

This article mainly uses user data, music work data, user behavior data and behavior context data to mine user preferences, and complete the recommendation process. However, there are actually a lot of data that can be added to the calculation of the recommendation process. Typically, there are tag data. Tag data are used by users to mark their

feelings and experiences of musical works, so tags can associate users with musical works. These data should be focused on in follow-up research.

In this paper, the optimization and experimentation of the recommended method, system design, and system realization process are all completed in an experimental environment. However, in practical industrial applications, the number of user data and music works is massive, which requires personalized services with extremely high performance and efficiency. However, the fundamental of the music intelligent push system is economic benefits. In addition, it is also necessary to consider whether the method in this article can meet the requirements of the push system and produce satisfactory economic benefits.

Data Availability

No data were used to support this study.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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