Hindawi
Mobile Information Systems
Volume 2022, Article ID 7873636, 12 pages
https://doi.org/10.1155/2022/7873636

Research Article

Digital Development for Music Appreciation of Information Resources Using Big Data Environment

Yi Li

Foundation Department, Jiangxi Technical College of Manufacturing, Nanchang 330095, Jiangxi, China

Correspondence should be addressed to Yi Li; 161849021@masu.edu.cn

Received 29 April 2022; Revised 15 July 2022; Accepted 28 July 2022; Published 10 September 2022

Academic Editor: Mian Ahmad Jan

With the continuous development of information technology and the arrival of the era of big data, music appreciation has also entered the digital development. Big data essence is highlighted by comparison with traditional data management and processing technologies. Under different requirements, the required time processing range is different. Music appreciation is an essential and important part of music lessons, which can enrich people's emotional experience, improve aesthetic ability, and cultivate noble sentiments. Data processing of music information resources will greatly facilitate the management, dissemination, and big data analysis and processing of music resources and improve the ability of music lovers to appreciate music. This paper aims to study the digital development of music in the environment of big data, making music appreciation more convenient and intelligent. This paper proposes an intelligent music recognition and appreciation model based on deep neural network (DNN) model. The use of DNN allows this study to have significant improvement over the traditional algorithm. This paper proposes an intelligent music recognition and appreciation model based on the DNN model and improves the traditional algorithm. The improved method in this paper refers to the Dropout method on the traditional DNN model. The DNN is trained on the database and tested on the data. The results show that, in the same database, the traditional DNN model is 114 and the RNN model is 120. The PPL of the improved DNN model in this paper is 98, i.e., the lowest value. The convergence speed is faster, which indicates that the model has stronger music recognition ability and it is more conducive to the digital development of music appreciation.

1. Introduction

With the development of information technology and the arrival of the era of big data, some high-tech means have also entered the field of music, especially in the application of multimedia courseware. With the increasing maturity and popularization of multimedia technology, it plays an increasingly important role in teaching. As an important medium to implement the aesthetic value of music, digital multimedia technology plays an incomparable advantage in the teaching of music appreciation. The use of digital multimedia technology has greatly improved classroom efficiency and enriched the teaching content. Multimedia technology can create a unique music situation, play its unique charm, make students can not help falling in love with music, and enhance students' interest in music learning. Digital multimedia technology can combine sound, pictures, text, moving images, and other elements to create a more ideal teaching environment and teaching effect than traditional music appreciation teaching.

The rapid development of information technology and Internet technology has made the traditional printed resources—musical scores and written description texts, and audio resources gradually electronic and digitized. The classification of traditional music resources is basically positioned at the level of discipline and instrumental music. These categories are far from being able to accommodate the newly added electronic music resources. Even if new classification methods are proposed now, such as providing relevant metadata standards for music types of documents, they cannot fully meet the inspection needs of various forms of digital music resources. Even if new classification methods are proposed, such as providing relevant metadata standards for music types of documents, they cannot fully meet the

inspection requirements of digital music resources in various forms (video, audio, pictures). The well-known metadata standards put forward by the world scholars at present stipulate the scope and form of more general resource metadata. However, the specification of digital music resources is not clear and specific enough, so that resources cannot be reused and dispersed in actual operation. People's demand for music resources is not limited to teaching. It also includes daily appreciation, tourism introduction, corporate product promotion, and other diversified uses. At the same time, with the integration of artificial intelligence, data sharing, and Internet technology into various fields related to music, it has become a concept that people are increasingly pursuing through technology dissemination, sharing, and optimization of music resources. In order to solve the existing contradictions and meet the diverse needs of the vast number of demanders, the key problem that needs to be solved is to organize the existing digital music resources. It has a high degree of classification and uses a standardized description model to mark the attributes and classification context of resources, and at the same time, it can efficiently appreciate music resources. Therefore, starting from the big data environment, the classification system of digital music resources is designed and its big data model is optimized. It is an urgent problem to realize the appreciation of music resources from various angles.

The main innovations of this paper are as follows: (1) This paper proposes an improved DNN neural network model for speech recognition of music appreciation, which is better than traditional speech recognition. (2) This paper introduces the main research content of the paper in detail by combining chart analysis and data investigation. (3) This paper compares the proposed model with the traditional DNN model and RNN model, which can better reflect the advantages of this model.

2. Related Work

With the improvement of people's living standards, people have more and more artistic or spiritual pursuits, and the research on music appreciation has also become more and more in-depth. Among them, Smiraglia examines the effectiveness of a music festival's listening arts program in achieving its stated goals. It encourages the appreciation of Western classical music and breaks the stereotypes of Western classical music by developing listening skills. It fosters a deeper relationship with the imagination through music and art and encourages students' personal responses to music. Project observations indicated that participants believed that the listening arts project met the specific goals examined, at least in the short term. Both students and teachers responded positively to the program's unique combination of listening skills development, appreciation of classical music, and responding to music through the visual arts [1]. The Kruger and Saayman study conducted a traditional stylistic analysis of poetry. The results suggest that both linguistic analysis and appreciation of musical structure and mood are useful pathways into Spitzer's linguistic circle. Linguistic analysis and music appreciation can pave the way for literary appreciation [2]. Kokotsaki takes a quantitative approach. He conducted a visitor survey at an international jazz festival in South Africa to determine whether the festival would bring additional intangible benefits. The results show that tourists' postholiday behavioral intentions are a useful market segmentation tool. This further illustrates the potential for music festivals to generate benefits outside of the festival itself or host destination in the form of music tourism and music genre appreciation. The findings confirm that music festivals can generate far-reaching benefits and can contribute to their legacy [3]. The Sarah et al. study examines students' perceptions of school music during the transition to secondary school and determines which components of their music lessons help them feel happier with music at school. Sarah M's analysis of interview and questionnaire data reveals some students are disillusioned with music at the beginning of secondary school. The reason is that their initial high expectations for actual musical engagement opportunities were not met [4]. Trimble and Hesdorffer investigate whether unilateral hearing loss contributes to music appreciation problems. They used a tailored questionnaire to investigate the music appreciation abilities of SSD patients, analyzing the data to assess statistical differences between groups. And the results reveal negative effects in social situations surrounding music, as well as a strong preference for limiting background music. Hearing aids have not been found to significantly improve these effects [5]. Thea compares festival-important motivational dimensions to broader festival motivational dimensions to uncover similarities and differences. Thea found that festival audiences proved to be motivated primarily by the festival's core offering. Socialization has become the main motivating factor compared to the average festival participant [6]. There are some limitations or deficiencies in the research or appreciation of music by the scholars. Smiraglia only draws conclusions about a particular festival, Kruger M only evaluates a certain lyric, and Kokotsaki analyzes the market revenue of a festival. Sarah M conducted a questionnaire survey on school music-related students, and Trimble analyzed the impact of unilateral hearing loss on music appreciation. Thea explores the motives of the festival. These studies are not comprehensive and specific enough, many are based on theoretical aspects, lacking in-depth practical proof, and the conclusions drawn need to be further confirmed.

3. Music Appreciation Based on Big Data Technology

3.1. Big Data. Big data concept: from a narrow point of view, big data can be called massive and rapidly growing, complex and constantly changing, high-speed and diverse, profound, and wide-ranging, a collection of various types of data that cannot be stored, mined, analyzed, and processed with traditional technical means, methods, and thinking patterns. Big data technology is the development, utilization, and popularization of big data. From a broad perspective, big data technology should also include technical means and thinking modes for processing, storing, and analyzing big

data technology. It further extends to talents, organizations, institutions, governments, and enterprises that process big data [7, 8].

Generally speaking, big data is a data set whose essence is highlighted by comparison with traditional data management and processing techniques. And under different needs, the time processing range required is different. The most important point is that the value of big data is not the data itself. It is the "big decision," "big knowledge," and "big problem" reflected by big data [9]. Its conceptual diagram can be shown in Figure 1.

The characteristics of big data: It mainly has the characteristics of complex structure, huge quantity, diverse types, and low value density, as shown in Figure 2. At present, big data is changing from calculating some data to analyzing all data, from calculating microscopic results to discovering macrotrends, and from exploring cause and effect to exploring information correlation [10, 11].

Big data core technology: It includes big data collection technology, storage technology, mining and analysis technology, and visualization technology. Its specific content can be shown in Figure 3.

At present, the main application fields of big data are e-commerce industry, financial industry, biotechnology, smart government, education industry, transportation industry, medical industry, and others [12], as shown in Figure 4 for some big data application fields.

The development status of big data: From the proposal of the concept of big data in 2011 to the popularization of big data technology today, its development process basically rises with the change of computer information technology. The transformation of information technology has mainly gone through multiple stages such as "decision support, management information, data warehouse, data mining, and the era of big data." For the current big data technology theory, it is the synthesis, deepening, and sublimation of the theories under the new situation. Through the storage, mining, analysis, processing, and application of structured or unstructured complex data, we strive to reveal the connections between things. It thus produces valuable judgments and predictions. The theory is currently in the stage of blooming and flourishing, and the development of information technology will be in the stage of big data technology for a long time now and in the future [13, 14]. In this paper, through the statistics of the literature of HowNet, the statistical table of academic literature related to big data is obtained, as shown in Table 1.

As can be seen from Table 1, among the current academic literature on big data, there are 18.459 million papers involving big data content. There are 291,900 articles related to big data topics, 218,400 articles in academic journals, and 31,700 articles in academic papers. It can be seen that the current academic research on big data is already in full swing [15]. In addition, this paper also counts the development of academic research in the past 10 years, as shown in Table 2.

As can be seen from Table 2, 186 papers related to big data were published in 2009, which increased to 51,770 in 2018. Its rapid growth rate also shows that big data technology is getting more and more attention in China.

Judging from the historical development track, the revolution of information technology has evolved from supporting decision-making, managing information to data storage, mining, and the generation and popularization of big data. It goes from the modern "analyzing the present" to the current "predicting the future." Information technology is constantly innovating, and the application field of big data technology is continuously expanding and deepening, which has accelerated the arrival of the era of big data [16, 17].

3.2. Music Appreciation. Music appreciation is an essential and important part of music lessons, which can enrich people's emotional experience, improve aesthetic ability, and cultivate noble sentiments. The level of a person's ability to appreciate music reflects the level of a person's self-cultivation and cultural level. Music appreciation class is irreplaceable in any classroom form in music teaching [18].

At present, music can be divided into different categories according to different ways. For example, according to different expressions, it can be divided into vocal music and instrumental music. According to the melody, it can be divided into classical music, pop music, and folk music, as shown in Figure 5.

Contextual application in music appreciation is particularly important. With regard to situational application, the most common method at present is to combine multimedia. Due to the rapid development of society and the updating of teaching methods, multimedia is no longer unfamiliar to students. Most high schools can have their own multimedia classrooms and multimedia environments. From an artistic point of view, tape recorders, CDs, VCDs, video recorders, televisions, multimedia equipment, computer networks, and others are all communication media and belong to new teaching methods. Multimedia operating platforms and network technology have become mainstream media in contemporary school classrooms. The operation of computer music technology and teaching system and the production of multimedia music courseware have created a good environment for students' auditory and visual experience. By creating a multimedia situation, it creates an atmosphere of comprehension of music. Due to the particularity of multimedia situations, it can be used throughout the classroom [19, 20].

The use of multimedia situations in music appreciation is also relatively common. As shown in Figure 6, one of the forms of music stage combined with multimedia is shown. Due to the space limitations of the scene, it is more difficult for the audience to be truly immersive. If it can be conveyed to students through multimedia display pictures, images, music, and other information, it can help students understand music well. For example, when appreciating the music of "Carmen," it first prepares a few red, pink, and yellow cardboards. In the teaching process, by listening to Carmen's music, on the one hand, it helps us to grasp the developmental context of musical emotions as a whole when listening to music. On the other hand, it helps to add operational activities when listening to music and feel the music through the combination of audiovisual

Figure 1: Schematic diagram of big data concept.

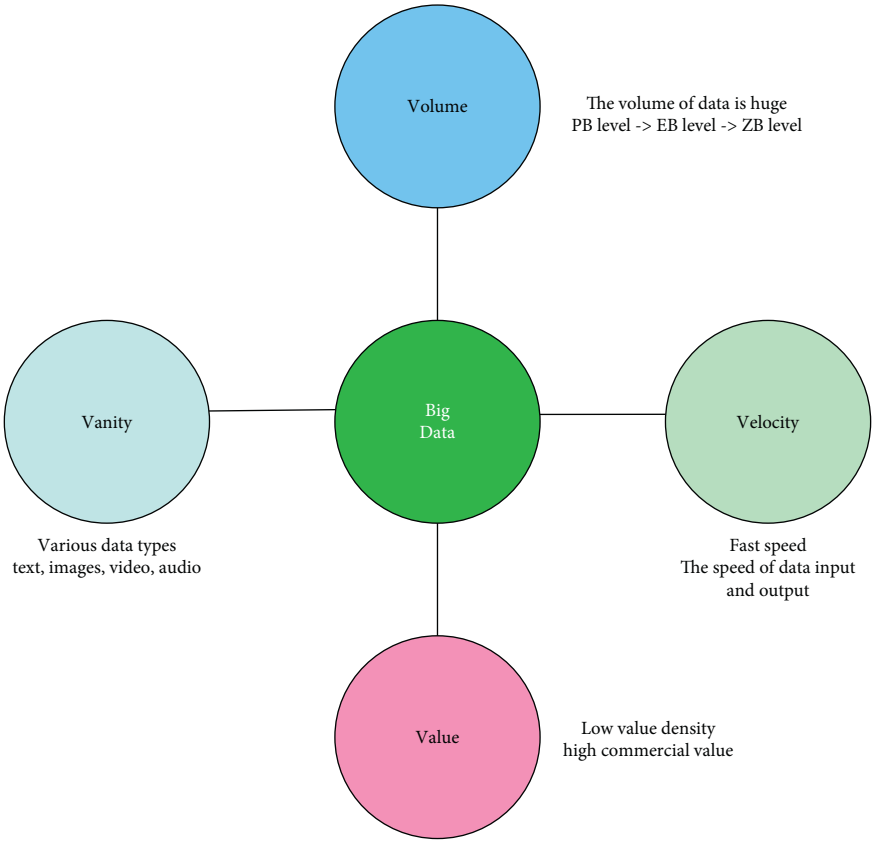


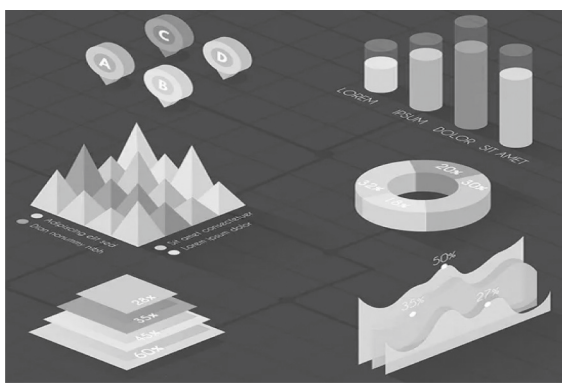
Figure 2: Characteristics of big data.

Capture massive amounts of structured and unstructured data from a variety of sources,Including database collection, network data collection and file collection

(a)

Big data storage refers to the process of using memory to store collected data in the form of a database, including a variety of routes

(b)



Connect to some BI platforms to visualize the data obtained from the analysis and use it to guide decision-making services. Mainstream BI platforms such as foreign agile BI Tableau, Qlikview, PowrerBI, etc

(c)

The process of extracting, refining and analyzing disorganized data from the aspects of visual analysis, data mining algorithm, predictive analysis, semantic engine, data quality management, etc.

(d)

Figure 3: Big data core technologies: (a) data acquisition; (b) data storage; (c) data visualization; (d) big data analysis and mining.

Traffic big data is the comprehensive use of modern traffic technology, information technology and computer technology, navigation and positioning technology, image analysis technology, etc. function, so as to make the traffic system intelligent and better achieve the goals of safety, smoothness, low pollution and low energy consumption.

(a)

By collecting, collating, and analyzing such a wide variety of data, health care informatization workers will bring creative changes to industries and fields such as clinical diagnosis and treatment, drug research and development, health monitoring, public health, policy formulation and implementation, from basic medical research to health care The whole life cycle of medical applications serves the public.

(b)

Figure 4: Typical applications of big data: (a) traffic big data; (b) medical big data.

Table 1: Statistics of academic literature related to big data.

Classification of papers	Number: ten thousand
Thesis	3.17
Academic journals	21.84
Theme	29.19
Full text	1845.9

Table 2: Development of academic research on big data.

Year	All relevant literature
2009	186
2012	2892
2015	27273
2018	51770
2021	48464

and action. Multimedia situations are not necessarily video and music. In the music class, pictures also belong to one of them.

Performance situation is another way of music appreciation. Through the way of performance, it feels, expresses, and understands music in the classroom, which is close to the real situation, as shown in Figure 7. It can be understood directly through the performance of the actors or by allowing the audience to perform situational interpretations. The former is generally used more in the introduction part, while the latter can be used in teaching new courses and classroom exploratory activities. Performance activities are creative experiential activities to prepare for further understanding of musical situations. Performance situations can be applied to courses on music subjects such as folk songs, operas, and musicals. Due to the performance and expressive color, it prefers this kind of works to a certain extent. In performing situational teaching, actors can creatively combine local music or repertoire with performance characteristics with music appreciation lessons. It allows the audience to understand their hometown and the culture and music around them and enhances the sense of national pride and belonging. The basic elements of music performance refer to various elements that make up music, including pitch, length, strength, and timbre. These basic elements are combined with each other to form the common "form elements" of music, such as rhythm, tune, and harmony, as well as strength, speed, mode, musical form, texture, and others. The formal elements that make up a musician are the means of musical expression. The most basic elements are rhythm and melody.

3.3. Development of Digital Music. The development of music in China has a long history, and it has gradually formed a musical melody since Xia and Shang. Up to now, the types and scope of music can be said to be huge. At present, the classification research of music mainly focuses on the constituent elements of music itself, such as musical instruments, regions, voices, and musical properties. At the same time, there are corresponding researches on classification algorithms. For example, in the application of neural network optimized by adaptive mutation ion swarm algorithm in music classification, these classification methods mainly focus on the characteristics of music itself. However, it does not make corresponding explanations for many extensional characteristics of music, such as carrier, version, and purpose.

The use of music resources can be divided into two categories; the first is the use of music resources in music teaching or music culture. For example, red music resources are applied to music education and teaching in local colleges and universities through classroom teaching, campus culture, and practical activities. Or by supporting the development of public music culture, it stimulates farmers' music consumption. It introduces local college music education resources in the construction of music culture in the new countryside by means of college teachers and students leading and participating in cultural activities in the new countryside. The second category is the use of music resources for curriculum teaching in other disciplines. As in the context of information technology, the literature uses online classrooms and other auxiliary multimedia. The development of music resources mainly focuses on the construction of local or different styles of music resources. For the digitization process of music, it is generally to perform binary processing on various forms of music. It makes it easy to store, transmit, convert, process, and others, as shown in Figure 8.

The management of music resources is mainly completed by using the network resource platform, such as the music resource management and playback of the management platform of the music resource library of art schools. In addition, some scholars have also carried out a certain degree of research on the description and classification of music resources. Documentation exploits the functional requirements of bibliographic records to establish intrinsic connections between different parts of a single musical work or multiple expressions of the same work. It fully reflects the essential characteristics of musical works and improves students' appreciation ability.

This paper starts with the distribution status of online music education resources and the needs of teachers, students, and music lovers. After analyzing four music education resource classification and navigation websites, this paper proposes a four-level classification system with one first-level category by using the literature taxonomy.

First, the scope of application of the research is almost all school education, ignoring the diverse needs of music resources. The main position of school education is the music classroom, and the use position of the music resources mentioned in the research is basically the music classroom. The demand for music resources in education is very large. However, ordinary users, such as teenagers who love music, or groups, such as radio song-demanding columns, also have a great demand for music resources. It also has different needs from educational resources.

Second, whether it is the development of music resources, the appreciation of music resources, or the classification of music resources, the description of the database is all over the place or even never mentioned. The field model

Folk music is produced in the folk, spread in the folk, the performance of folk life, the production of songs or music

(a)

Classical introduction refers to those Western classical music that began in the Middle Ages in the West and was created in the context of mainstream European culture. It is different from popular music and folk music mainly because of its complex and diverse creation techniques and the heavy connotation it can carry

(b)

Popular music is translated from English Popular Music. The accurate concept of popular music should be commodity music, which refers to music created for the main purpose of profit. It is commercial musical entertainment and all "industrial" phenomena associated with it.

(c)

Figure 5: Classification of music: (a) folk music; (b) classical music; (c) popular music.

Figure 6: Multimedia context.

Figure 7: Music performance situation.

used by the database is not standard. It can only be said that an isolated resource library is established, and the migration and transplantation of resources cannot be completed. The resource classification entries in the music resource library are sorted out according to the attribute fields in the database. However, the market will use different semantic

participles for concepts with the same connotation, which will lead to obstacles to users' understanding of the appreciation content.

Third, the appreciation of resources is basically defined in the attribute field with clear concept. The setting of the appreciation content of online music is basically defined on the phrases with clear concepts, such as album name, country, singer, time, style, song title, and so on. But many users do not have a very clear goal when looking for online music resources. They only look for songs with emotions such as stealing joy and sadness according to their own mood. In addition, music itself has a deep-rooted relationship with emotion. Therefore, incorporating emotion into the scope of appreciation is not only the requirement of music resources itself, but also the needs of users. Of course, the emotional classification of music is first of all many. Second, its boundaries are blurred. Therefore, how to distinguish this fuzzy boundary with quantitative data and realize the appreciation of online music resources with emotion as the label is one of the problems that needs to be studied. At present, many music websites, such as Baidu Music, Google Music, and Sogou Music, are not regular in the appreciation of emotions and ignore the diversity of music emotions. Therefore, it is necessary to improve the existing appreciation methods [21].

Fourth, the appreciation is too professional. Based on melody, humming, and content, the appreciation method is mainly to extract the acoustic signal of music and compare the melody and spectrum. This kind of appreciation method is too professional and requires relatively high hardware equipment, so it is difficult to promote it in a large scale.

4. DNN-Based Intelligent Music Appreciation Model Test

4.1. Big Data Intelligent Music Appreciation Model

4.1.1. Deep Learning Neural Network. A deep learning neural network is essentially a multilayer perceptron with multiple hidden layers. Its structural model is shown in Figure 9.

This paper introduces DNN as a data analysis model for music appreciation, where DNN is assumed to contain L hidden layers, and its input $h^0 = X$, and the activation value of the hidden layer is

$$\begin{aligned} a^t &= W^t h^{t-1} + b^t, \\ h^t &= f\left(a^t\right). \end{aligned} \tag{1}$$

Among them: b and W are the bias and weight, respectively, and f is the activation function.

The traditional activation function is

$$\begin{aligned} h^t &= \sigma\left(a^t\right), \\ h_j^l &= \frac{1}{1 + e^{-a_j^l}}. \end{aligned} \tag{2}$$

For the output layer of this neural network, its sample posterior probability is expressed as

$$\begin{aligned} y_s &= h_s^{L+1} \\ &= \Pr(s|X) \\ &= \text{softmax}_s\left(a^{L+1}\right). \end{aligned} \tag{3}$$

Among them: y_s represents the output value of the sth data.

In intelligent music appreciation, the CE criterion (cross entropy criterion) is applied to its speech recognition, and the formula is

$$\begin{aligned} \mathrm{F}(\theta) &= -\sum_{r=1}^{R} \log\left(\text{softmax}_{sr}\left(a^{L+1}\right)\right) \\ &= -\sum_{r=1}^{R} \log\left(\Pr\left(sr|X_r\right)\right). \end{aligned} \tag{4}$$

Among them: θ is all parameters in DNN, and sr is the output feature value of X_r.

The common optimization problems of DNN are

$$\theta^* = \arg\frac{\min}{\theta \in R^N} \mathrm{F}(\theta). \tag{5}$$

When l is the output layer, its error value is

$$\begin{aligned} e_j^l &= \frac{\partial}{\partial a_j^l} \log \Pr\left(sr|X_r\right), \\ e_r^{L+1}(s) &= \frac{\partial \log \ y(s_r)}{\partial a_r^{L+1}(s)} \\ &= y_r(s) - \delta_r(s). \end{aligned} \tag{6}$$

$\delta_r(s)$ is 1 or 0.

When l is the hidden layer, its error value is

$$\begin{aligned} e_r^l &== \frac{\partial \log \ y(s_r)}{\partial a_r^l} \\ &= \left(W^{l+1}\right)' \left(e_r^{l+1} \odot \frac{\partial h_r^l}{\partial a_r^l}\right), \end{aligned} \tag{7}$$

where $\odot$ is the multiplication of vectors.

At this time, the weight gradient is

$$\frac{\partial \mathrm{F}}{\partial W^l} = e_r^l \left(\partial h_r^{l-1}\right)'. \tag{8}$$

It gets updated:

$$\begin{aligned} \Delta W_{t+1}^l &= \rho \cdot \Delta W_t^l - (1 - \rho) \cdot \eta \frac{\partial \mathrm{F}}{\partial W_t^l}, \\ W_{t+1}^l &= W_t^l - \Delta W_{t+1}^l, \end{aligned} \tag{9}$$

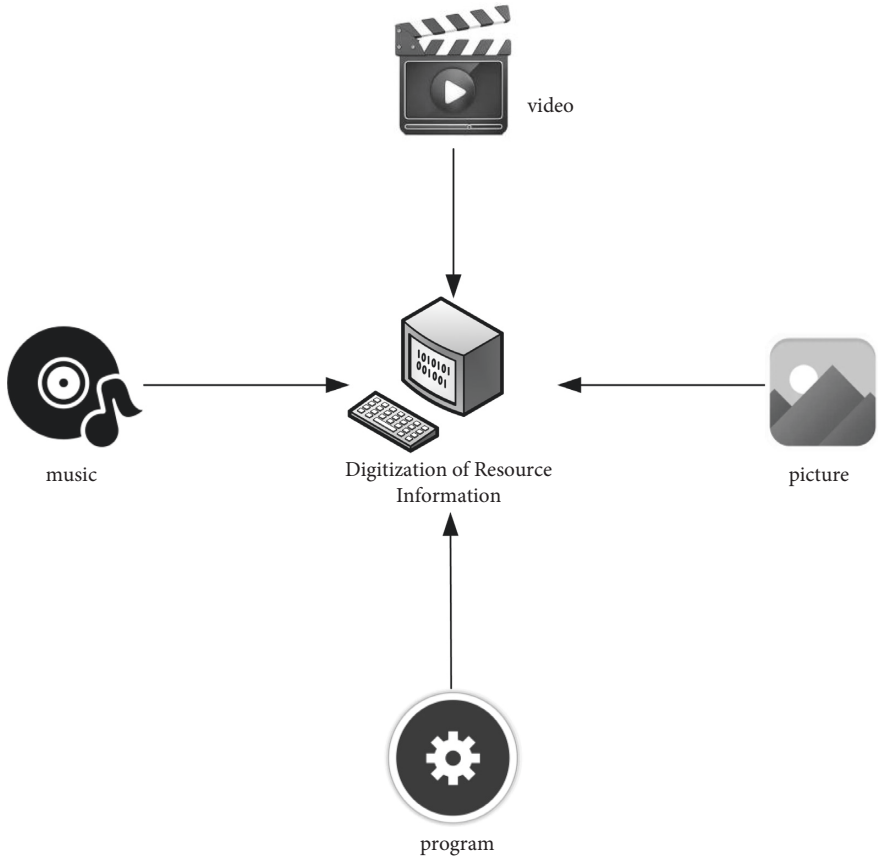


Figure 8: Schematic diagram of digital music concept.

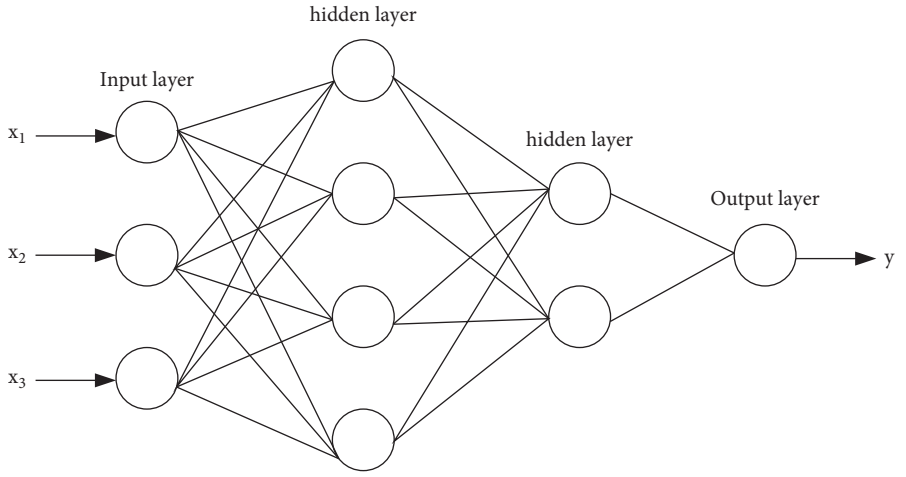


Figure 9: DNN neural network model.

where η and ρ are the learning rate and change factor, respectively.

4.1.2. Improved DNN Model. In the actual process, the objective function needs to be adjusted appropriately, which can effectively prevent too large weights in the parameter update process, and its update method is actually adjusted as follows:

$$\Delta W_{t+1}^{l} = \rho \cdot \Delta W_{t}^{l} - (1-\rho) \cdot \eta \left(\frac{\partial F}{\partial W_{t}^{l}} + \beta W_{t}^{l} \right). \tag{10}$$

Among them: β is the attenuation coefficient, and the general value is 0.01%.

For the improvement of the model, this article refers to the Dropout method (that is, random deactivation regularization, which is a regularization method, by setting a

Table 3: Division of VoxForge and CHIME databases.

Corpus	VoxForge (K)	CHIME (M)
Train	930	153
Valid	74	8.9
Test	82	8.9

probability of elimination for the nodes of a certain layer of the network and then randomly eliminating some nodes in the training according to the probability, in order to achieve regularization and reduce variance), where the posterior probability is

$$P(x|s) = \frac{P(s|x)P(x)}{P(s)}. \tag{11}$$

For a DNN with L hidden layers, the forward calculation based on Dropout is

$$\begin{aligned} r^l &= \text{Bernouli}(p), \\ h^{l+1} &= f\left(r^l \odot h^l W^l + b^l\right). \end{aligned} \tag{12}$$

Among them: r^l is a random variable, and p represents the probability of the variable.

For the reverse conduction of the error, the gradient update calculation method is

$$\Delta w^{t+1} = m^{t+1}\Delta w^t - \varepsilon\left(1 - m^{t+1}\right)\nabla_w L,$$

$$m^t = \begin{cases} \frac{t}{T}m_f + \left(1 - \frac{t}{T}\right)m_i t < T, \\ m_f t \geq T. \end{cases} \tag{13}$$

Here ε is the learning rate, $T = 10$ s, $m_f = 0.9$, $m_i = 0.5$, and $\nabla_w L$ is the average gradient of the objective function in the Lth layer.

4.2. Simulation Experiment. This experiment verifies the music modelability of the optimized DNN based on the VoxForge (it is a speech corpus and acoustic model library for an open source speech recognition engine. Released by VoxForge, this dataset was created to collect annotated recordings for free and open source speech recognition engines. The publisher opens all recording files under the GPL agreement and uses this to make acoustic models for use by the open source speech recognition engine) and CHIME databases. Table 3 is the division of the training set, development set, and test set of the two databases.

Based on the optimized DNN language model, the DNN hidden layer adopts the ReLU activation function. The network is initialized randomly and does not require unsupervised training. The VoxForge and CHIME task minibatches contain 400 and 600 words, respectively. The initial learning rate for training is 0.35. The learning rate is kept constant until the PPL on the development set does not drop by more than 1.5 from the previous iteration. After that, 5 more iterations are performed, each time the learning rate is halved.

Table 4: PPL performance for different music models of the database.

Model	PPL
RNN-LM	112
DNN	96
Improved DNN	90

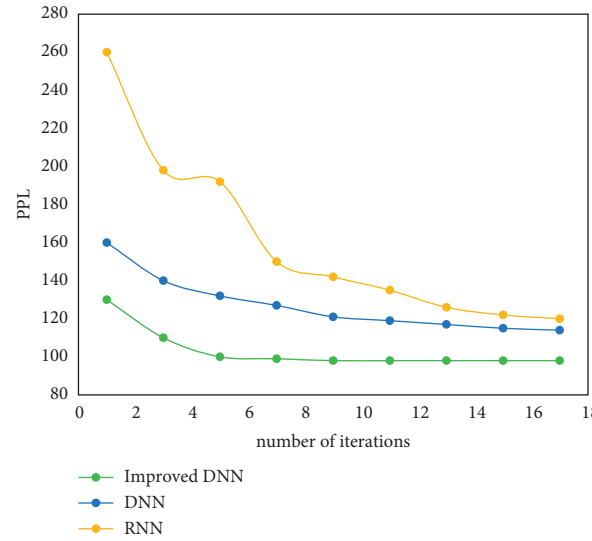


Figure 10: PPL statistics after testing.

4.3. Experimental Results. For the VoxForge and CHIME tasks, this paper trains different music models, including RNN neural network models (RNN is a special neural network structure, which is based on the view that "human cognition is based on past experience and memory." It is different from DNN and CNN: it not only considers the input of the previous moment, but also gives the network a "memory" function of the previous content). For the traditional DNN neural network model and the improved DNN model in this paper, the training results are compared with the PPL (that is, data confusion, which is used in the calculation of data classification in machine learning, here to solve the classification problem of neural networks) according to the performance of different music models, and the average value of the PPL is obtained, as shown in Table 4.

It can be seen from Table 4 that, in the same database, the PPL of the improved DNN model is 90, the lowest value. It can be seen from the training that the model has stronger music recognition ability.

Figure 10 is the statistical graph of the PPL after the actual test of the trained RNN, DNN, and the improved DNN memory model.

As can be seen from Figure 10, the PPL of the improved DNN model is smaller than that of the traditional DNN model, and its test value is 98, while the traditional DNN model is 114 and the RNN model is 120. And it can be seen that the convergence speed is faster, indicating that the improved DNN model in this paper has better performance. For the contextual relevance of music digitization, the PPL

value shows an exponential decay trend according to the number of iterations; that is to say, the model's ability to identify music in music appreciation tends to increase.

5. Discussion

Starting from the deep neural network model, this paper proposes some improved or new deep neural network structures for music appreciation modeling for speech recognition. It significantly improves the performance and training efficiency of the speech recognition system. However, the research in this paper still needs to be further explored and improved. At the same time, in order to further improve the performance of speech recognition systems, more groundbreaking research is still needed.

(1) Regarding the proposed network structure with decreasing hidden layer nodes, this paper adopts a prior design method to determine the network structure. For different tasks, this paper needs to go through experiments to choose a good network structure. This is also a problem in deep learning at present: the design of network size has no certain theoretical guidance and can only be explored through experience guidance and experiments. A more effective approach should be to automatically learn the structure of the network, including the number of hidden layers of the network and the number of nodes in the hidden layer.

(2) In some cases with strong far-field and noise interference, the performance of the speech recognition system is still not ideal. Therefore, it is a problem to be further studied to solve the speech recognition under far-field and strong noise interference conditions. In addition, end-to-end speech recognition is also a hotspot that is currently being studied and needs further research.

6. Conclusion

In the abstract, this paper first gives an overview of the overall content of the full text and then introduces the background of the big data era in the introduction. This paper introduces the relevant content of digital music and summarizes the innovation of this paper. This paper cites some related researches in the related work part, so as to understand the current situation of the related content researched in this paper. Then in the theoretical research part, this paper firstly introduces the concept, characteristics, core technology, application fields, and development status of big data. Secondly, this paper introduces the related concepts, classification, and situation analysis of music appreciation. Finally, this paper introduces digital music, including its concept and music data resource management. By comparing the RNN model with the traditional DNN model and the improved DNN model in this paper through experiments, it is concluded that the model in this paper has lower PPL and stronger speech recognition, which is more conducive to the digital development of music appreciation.

With the in-depth development of the domestic economy, the reform of the economic system has also been continuously advanced. As an emerging industry, the music industry has great potential for development. It is of great significance and effect to seek an effective digital organization and agglomeration model for enhancing the comprehensive strength of the music industry. In the development practice of the music industry, both theoretical researchers and practical workers must innovate the development concept of the music industry, transform the industrial development model, optimize the industrial organization and agglomeration structure, and promote the continuous improvement of the development of the music industry.

Data Availability

No data were used to support this study.

Conflicts of Interest

There are no potential conflicts of interest in this study.

References

[1] C. Smiraglia, "The art of listening: listening skill development, classical music appreciation, and personal response through visual art in a middle school program," *Research and issues in music education*, vol. 14, no. 1, p. 2, 2018.

[2] M. Kruger and M. Saayman, "Segmenting beyond behavioural intentions - fine tuning music festival visitors' music appreciation," *International Journal of Event & Festival Management*, vol. 8, no. 2, 2017.

[3] D. Kokotsaki, "Pupil voice and attitudes to music during the transition to secondary school," *British Journal of Music Education*, vol. 34, no. 1, pp. 5–39, 2017.

[4] M. Sarah, E. A. Hough, C. Gemma, K. Rachel, S. Mark, and D. M. Baguley, "The impact of single-sided deafness upon music appreciation," *Journal of the American Academy of Audiology*, vol. 28, no. 5, pp. 444–462, 2017.

[5] M. Trimble and D. Hesdorffer, "Music and the brain: the neuroscience of music and musical appreciation," *BJPsych International*, vol. 14, no. 2, pp. 28–31, 2017.

[6] V. Thea, U. Pek, and S. Joey, "Socialization or genre appreciation: the motives of music festival participants," *International Journal of Event and Festival Management*, vol. 8, no. 3, pp. 274–291, 2017.

[7] Z. Na, "Database design of regional music characteristic culture resources based on improved neural network in data mining," *Personal and Ubiquitous Computing*, vol. 24, no. 1, pp. 103–114, 2020.

[8] P. M. Bennington, "Still making music: how students with traumatic brain injury can continue with musical activities," *Music Educators Journal*, vol. 103, no. 4, pp. 20–24, 2017.

[9] K. Strand and B. Brenner, "Learning to Be creatively expressive performers," *Music Educators Journal*, vol. 103, no. 3, pp. 21–26, 2017.

[10] J. Kim, "Transforming music education for the next generation: planting 'four Cs' through children's songs," *International Journal of Early Childhood*, vol. 49, no. 2, pp. 181–193, 2017.

[11] J. M. Dakon and E. Cloete, "The Violet experience: social interaction through eclectic music learning practices," *British Journal of Music Education*, vol. 35, no. 1, pp. 57–72, 2017.
[12] M. A. Duarte-García and J. R. Sigal-Sefchovich, "Working with Electroacoustic Music in Rural Communities: the use of an interactive music system in the creative process in primary and secondary school education," *Organised Sound*, vol. 24, no. 3, pp. 228–239, 2019.
[13] H. J. Kwon, "Teaching-learning and evaluation methods of primary school Korean music for the 'music in daily life' domain under the 2015 revised music curriculum," *The Journal of Korean Music Education Research*, vol. 11, no. 1, pp. 5–35, 2017.
[14] Endong and F. Patrick, "The influence of westernised and hybridised christianity on the appreciation of traditional art in Nigeria," *American Journal of Arts and Design*, vol. 2, no. 2, pp. 52–59, 2017.
[15] H. John and Liesl, "A conceptual study of spirituality in selected writings of émile Jaques-Dalcroze," *International Journal of Music Education*, vol. 35, no. 2, pp. 175–188, 2017.
[16] C. Welch, M. Dillon, and H. Pillsbury, "Electric and acoustic stimulation in cochlear implant recipients with hearing preservation," *Seminars in Hearing*, vol. 39, no. 4, pp. 414–427, 2018.
[17] R. Mountain, "Elaborating analogies of time perception," *Organised Sound*, vol. 25, no. 2, pp. 259–268, 2020.
[18] J. A. Fisher, "Jazz and musical works: hypnotized by the wrong model," *The Journal of Aesthetics and Art Criticism*, vol. 76, no. 2, pp. 151–162, 2018.
[19] B. Biehl, "'In the mix': relational leadership explored through an analysis of techno DJs and dancers," *Leadership*, vol. 15, no. 3, pp. 339–359, 2019.
[20] S. Tohyama and Y. Takeuchi, "Proposing a design of collaborative creative musical activity and an evaluation method as STEAM education::focusing on changes of primary school children's self-esteem," *The Transactions of Human Interface Society*, vol. 20, no. 4, pp. 397–412, 2018.
[21] J. Kilroy, "Scaling new heights," *Sierra*, vol. 102, no. 3, p. 26, 2017.