Exploring the influence of music based on data analysis

Wanqi Lu[1], Chaoran Sun[2], Yuchen Cao[3]

[1]School of Financial Mathematics & Statistics, Guangdong University of Finance, Guangzhou, Guangdong, 510000, China

[2]School of Environmental and Municipal Engineering, Qingdao University of Technology, Qingdao, Shandong, 266000, China

[3]Nanjing Agricultural University, Nanjing, Jiangsu, 210095, China

Abstract: It is necessary to analyze the factors that influence the creation of musicians. Regarding the long history of music development, a single music artist may seem insignificant, but it may be a turning point in the entire history of music development, which contains inextricable connections. we firstly used data mining techniques to find out the most influential artists, and then used python language to establish a network of the three most influential artists, relying on Network X package, based on the idea of graph theory. the sub-network of the analysis graph network can clearly show the influence of these three artists. The pearson correlation coefficient is used to develop a music similarity measurement model, and then a heat map is made to directly reflect the relationship between genres and genres.

1. Introduction

Music, is the product of the development of human civilization, is also an indispensable part of it, the history of human development is also the history of music evolution. In the development and evolution of music, we call artists who influence other music producers' influencers, and artists who are influenced followers. The identity of the artist is not the only fixed, an artist can be both an influencer and a follower. A follower can be influenced by multiple influencers at the same ti me to get his or her own musical style, while an influencer can influence multiple followers at th e same time. Musical artists inherited or reformed elements or styles of previous musicians, which gave rise to different schools of music. If we plot these relationships into a network diagram, we will get a very complex mapping network. To do this, we will examine the evolutionary and evolutionary trends of artists and genres [1-4].

Its evolution process has witnessed the rise and fall of human society. Music creation is naturally a topic that humans have been paying attention to. It is also necessary to analyze the factors that influence the creation of musicians. Regarding the long history of music development, a single music artist may seem insignificant, but it may be a turning point in the entire history of music development, which contains inextricable connections. For this reason, we make this report to discuss in depth.

In this paper, we make contributions as follows:

A directional network is established between influencers and followers, and the ' music influence ' in this network is captured according to the index.

Models were built to measure similarity and to measure whether artist s within genres are more similar than artists across genres.

2. Directional Network Model between Influencers and Followers

Firstly, we need to build a network of diagrams. The influencer connection points to the follower, indicating that the influencer has influenced the follower. Extract the influencer name and follower name. An example is shown in the following section as figure 1:

	influencer_name	follower_name
0	The Exploited	Special Duties
1	Tricky	PJ Harvey
2	Bob Dylan	PJ Harvey
3	Leonard Cohen	PJ Harvey
4	The Gun Club	PJ Harvey
5	Chrissie Hynde	PJ Harvey
6	Crime & the City Solution	PJ Harvey
7	Lesley Gore	PJ Harvey
8	Massive Attack	PJ Harvey
9	Nick Cave	PJ Harvey
10	The Raincoats	PJ Harvey
11	Pretenders	PJ Harvey
12	Tom Waits	PJ Harvey
13	Marianne Faithfull	PJ Harvey
14	Patti Smith	PJ Harvey
15	Sonic Youth	PJ Harvey
16	Pere Ubu	PJ Harvey
17	Pixies	PJ Harvey

Figure 1. Example of the influencers name and follower's name

Then a directed graph is established for qualitative analysis of the scope of influence of the three people with the largest number of influences obtained in the previous step as figure 2. We can clearly see the scope of influence of these three people, and it can also be analyzed that The Beatles has more influence than Bob Dylan, while Bob Dylan has more influence than The Rolling Stones.
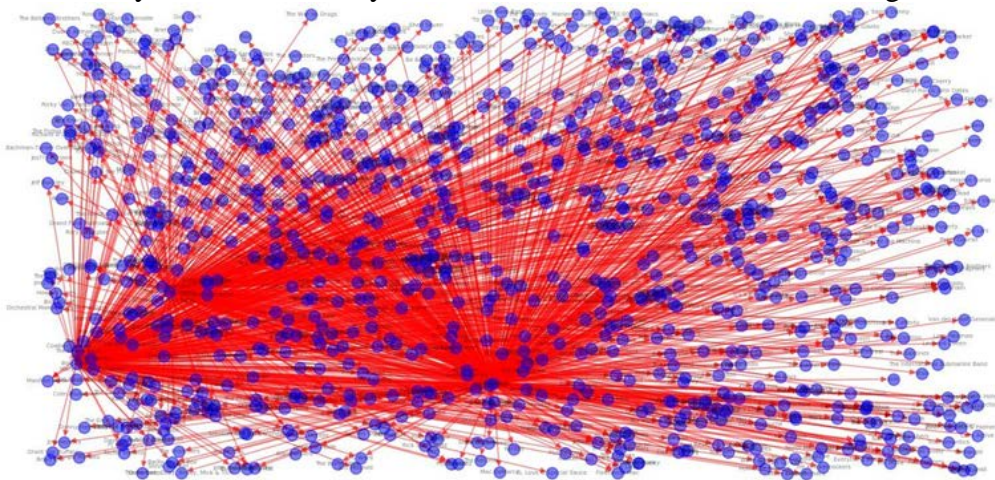

Figure 2. The directed graph models

In order to trace the source, the number of original ancestors in each field is found to analyze the artists and their works of various schools. The genres in the data set are comprehensively classified into 20 categories, and 40 is the number of genres that have not been de-repeated, as shown in the figure 3 below:

```
['Pop/Rock' 'Electronic' 'Reggae' 'Jazz' 'Country' 'Comedy/Spoken' 'R&B;'
 'Classical' 'Latin' 'Vocal' 'Folk' 'Easy Listening' 'International'
 'Avant-Garde' 'Blues' 'Stage & Screen' 'New Age' 'Religious' "Children's"
 'Unknown']
['Pop/Rock' 'Country' 'Classical' 'Electronic' 'Comedy/Spoken'
 'Easy Listening' 'R&B;' 'Stage & Screen' 'Reggae' 'Blues' 'New Age'
 'Latin' 'Vocal' 'Jazz' 'International' 'Folk' 'Religious' 'Unknown'
 'Avant-Garde' "Children's"]
20 40
```

Figure 3. The process to classify into 20 categories

Taking the genre as the benchmark, the number of people in each decade in the data set is comprehensively analyzed, and a table of the number of people in each decade of the genre is established, and a line chart is made to show the evolution trend and spread speed of the genre. It can be seen from the line chart that all genres first flourished and then declined, among which Pop/Rock had the largest number of people and the largest scale of development. All schools began to show a declining trend after 1960. Although some later schools improved in the 1970s, they still did not change the declining trend as figure4-5.

	Pop/Rock	Electronic	Reggae	Jazz	Country	Comedy/Spoken	R&B:
1930	79	5	11	59	35	11	42
1940	124	10	9	110	51	3	60
1950	326	26	30	126	105	7	175
1960	602	82	51	115	115	23	183
1970	482	98	42	46	95	18	111
1980	540	98	21	20	60	7	83
1990	466	76	11	6	65	4	84
2000	123	26	1	0	11	0	34
2010	9	3	0	0	0	0	3

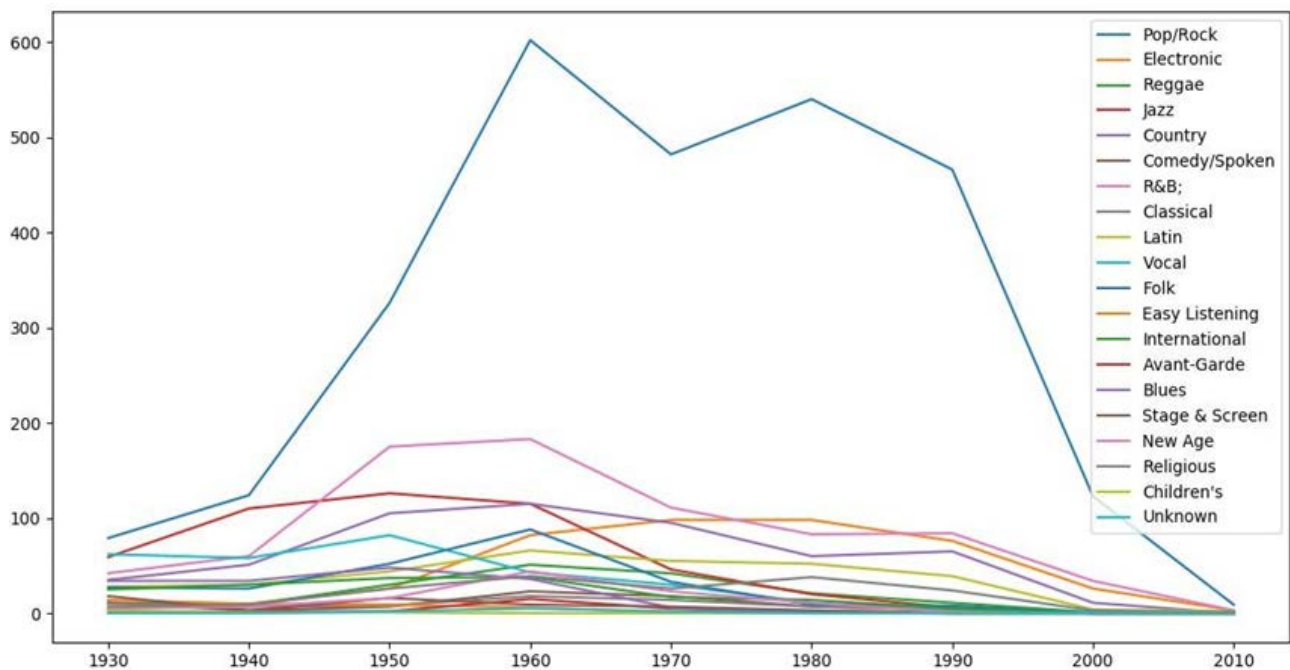|	Classical	Latin	Vocal	Folk	Easy Listening	International
1930	10	28	62	27	14	25
1940	7	30	58	26	10	30
1950	8	44	82	52	9	37
1960	18	66	43	88	6	38
1970	14	55	30	33	1	17
1980	7	52	11	9	2	14
1990	4	39	5	8	2	5
2000	0	4	1	0	0	0
2010	0	2	0	0	0	0

Figure 4 The Trend of different decades

Figure 5. Different kinds of music's trends in different periods

3. Similarities modeling process of the different kinds of music

3.1 Modeling preparation and concepts

Firstly, the concept of analytic hierarchy is introduced for the purposes of the following elaboration. The Analytic Hierarchy Process (AHP) is a combination of qualitative and quantitative analysis, a systematic, hierarchical analytical method.

The basic idea of analytic hierarchy process to solve problems is to deal with people to a multi-level, multi-factor, complex decision-making problem the thinking process is basically the same, the most prominent feature is hierarchical comparison, comprehensive optimization. The basic steps to solve the problem are as follows bottom:

(1) Analyze the relationship between various factors in the system, and establish the hierarchical structure of the system. The general hierarchical structure is divided into the first layer is the target layer, the second layer is the criterion layer, and the third layer is the scheme layer.

(2) Construct pairwise comparison matrix (judgment matrix), for each factor of the same level on a certain level the importance of (target) is compared pairwise, and the judgment matrix of pairwise comparison is constructed.

(3) The relative weight of the factors to be compared to each criterion is calculated by comparison matrix, and the consistency of judgment matrix is carried out test;

The combination weight and consistency test of the target layer are calculated and sorted.

When using the analytic hierarchy process to study a problem, the various factors related to the problem should be classified at first, and then constructed a hierarchical model of a tree structure is called a hierarchy diagram. A general hierarchy diagram is divided into three levels, as shown in Figure 6 shown below.

Pearson correlations are a way of measuring the similarity of vectors. The output range is -1 to +1, where 0 represents no correlation, negative value represents negative correlation, and po sitive value represents positive correlation.
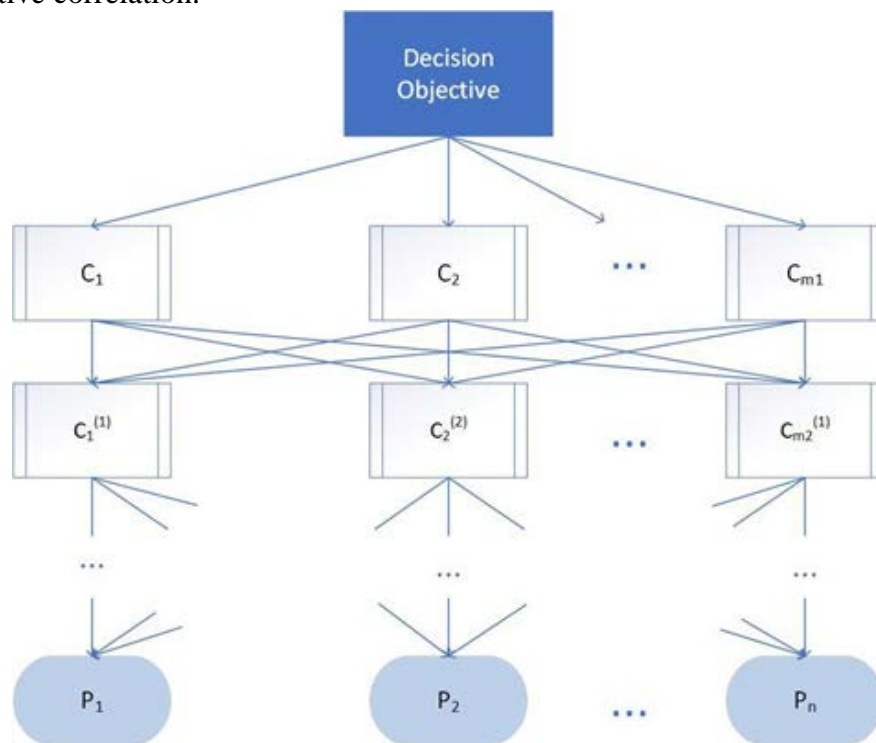

Figure 6. The Analytic Hierarchy Process Model

3.2 Modeling Process

After dimensionality reduction of full music data with SPSS, five principal components were obtained, and scores of each principal component were calculated according to the factor scores.

Different songs of ten artists were randomly selected, and Pearson correlation coefficient was used to calculate the similarity coefficient of five components, and the heat chart was made as following figure 7.

All Of You	vocal
There Once Was a Man	vocal
Rock, Salt And Nails	folk
****** Carmen	country
Go With The Flow	Pop/Rock
Mirage	Pop/Rock
You'll Be Mine	Pop/Rock
Smilin' On Ya	R&B;
*** Hangs Out - **** Remastered Version	Pop/Rock
Me Voy Lejos, Lejos, Lejos	Latin

Figure 7. The heat chart of music

According to the thermodynamic diagram analysis, we can see the same genre of songs may be very similar (All of You & There Once Was a Man) may also be very similar (Go with The Flo w & Mirage), show The same genre may be great changes have taken place in the history of the development, and different schools of similar degree, between schools are always able to influence each other.
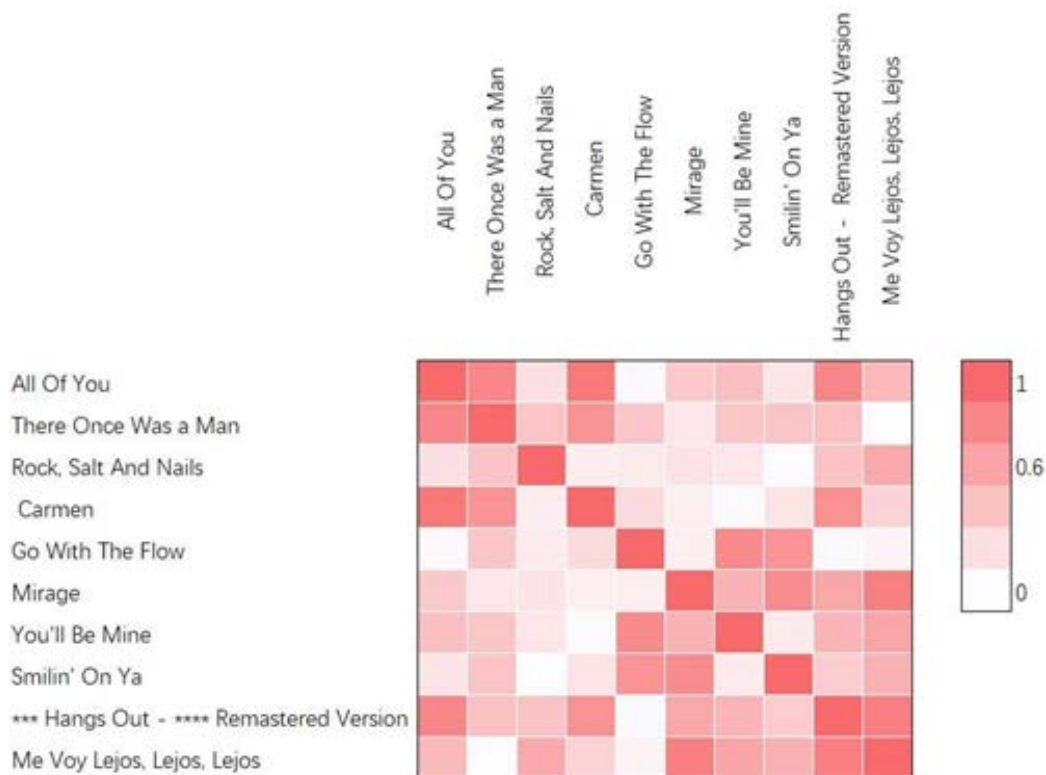

Figure 8. Pearson correlations of different songs

3.3 Result of the model

In the 1960s and 1970s, mainstream rock music in Britain became popular with the British on style. This type of rock music inherited the style of American rock and blues music, and it is a musical form based on guitar playing. The British rock music of this period had a great influence on the world. It advocated equality and yearned for freedom. The 1960s British rock formed the initial framework of rock music, and despite the changes in the following decades, the basic concept of British rock music has not been abandoned. In the mid-

sixties, the style of British rock evolved from Brit rock to psychedelic rock. Artists such as "The Beatles", "Bob Dylan" and "The Rolling Stone" have huge followings.

1. The Beatles

If rock n roll in the early development of the "elvis" outshine others, so the band "The Beatles" in the 60 s the rest of the world began to the mammoth, for the first time in the history of rock roll r evolution, they absorbed The fruits of numerous rock predecessors set up 50 s territory, rock ' n' roll can be converted to a younger, more popular, more rich melody of youth culture: with "The Beatles";, and rise of The British rock band in The form of chorus combination, created a pack and, competing, people call it "The Beatles era". At first, they were influenced by American rock and roll and R&B. Later, their songs became more unconventional and exploratory, with imaginative lyrics and seductive melodies that were unforgettable. It didn't take long for "The Beatles" to develop its own style and become known as The Voice of Mersey. Their song theme is distinct, involves a very wide range of rock music interpretation incisively and vividly. The British youth in the 1 960s were in a period of confusion and hesitation, and their traditional thoughts were forced to hange. The songs of" The Beatles" brought more hope to The British youth who were in confusion and pain.

2. The Rolling Stone

In 1962, "The Rolling Stone" was founded in London. The word" The Rolling Stone" also has a meaning in English. The meaning of desire, freedom and freedom from any constraints also reflected the most fashionable life concept of British youth at that time. Their music style has a distinctive rock and roll style, which also has traces of blues music. By The end of the 1960s, The Rolling Stones had become one of the most famous rock and roll bands in the world. They were second only to "The Beatles". Some people have called" The Rolling Stone"," The second"" The Beat les", but in fact they played very different styles of music. The Beatles were mainly influenced by the softer style of Saul, which developed a soft, light, genteel tone. The Rolling Stone's music was based on traditional 40s R&B. It was rough and powerful, and had a certain kind of aggression, cynicism, and swagger.

4. Conclusion

Nowadays, with the popularity of computers and mobile phones, more and more people choose to listen to music on the Internet, change the way people listen to music made digital music show explosive growth, there are more and more online music service music website, now in the online music service providers mainly include music company, a leader in the Google Play Music, Last. FM, etc.

Facing the massive digital music on the Internet, how to retrieve the music users want quickly and accurately has become more and more important, and has become a n important indicator of whether a music website user experience is friendly. Musi c retrieval information is the various music indicators in the paper, danceability, energy and so on. Similarly, music genre is an important index of music retrieval. To achieve automatic music generation, deep learning technology should be used to learn the musical characteristics of each index from many music data, a d then train good automatic music.

References

[1] Chetna Dabas, Aditya Agarwal, Naman Gupta, et al. Machine Learning Evaluation for Music Genre Classification of Audio Signals. 2020, 12 (3): 57 - 67.

[2] Thomas Robinson. Popular Music Theory and Analysis: A Research and Information Guide. 2017,

[3] Jean-Julien Aucouturier, Elias Pampalk. Introduction-From Genres to Tags: A Little Epistemology of Music Information Retrieval Research. 2008, 37 (2): 87 - 92.

[4] Phillip Hash. Introducing Unfamiliar Genres: Recommendations Based on Music Preference Research. 2002, 21 (1): 12 - 21.