# Research on the Influence of Musicians Based on Pagerank

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**Abstract:** There is influence between musicians. This paper uses the method of constructing influence oriented network, based on PageRank algorithm, obtains the influence index of musicians, and then obtains the influence ranking of musicians, which provides an idea for mining out real powerful and influential musicians.

## 1. Introduction

Music is a part of human society and an important manifestation of culture. Music is presented in different styles and forms, which not only reflects the uniqueness of artists, but also reflects the different culture, social environment and political background of each era. From 1930 to 2010, music changed a lot. For example, Elvis Presley initiated the history of rock music in 1954 and has influenced it so far. In the 1960s, electronic music entered a period of all-round development. In 1965, Bob Dylan opened the era of folk songs. In 2001, the iPod brought about the revolution of the record industry. Through the investigation of musicians, it is found that there is an influence between musicians. Musicians interact and learn from each other in the long river of time, creating a variety of musical forms. How to measure the influence of musicians? Which musician has more influence? In view of this, this paper uses the method of constructing influence oriented network, calculates the personal influence index of musicians, and obtains the influence ranking of musicians, so as to provide a new method for mining out really powerful and influential musicians.

## 2. Construction of Directional Network Relationship

Firstly, both influencers and followers are regarded as nodes in the network, and the influencers and followers are connected by a straight line with an arrow pointing from the follower to the influencer. This paper selects the data of 2010 as an example to study the directional relationship network. The network relationship is shown in Figure 1.



Fig.1 The Directed Network Relationship of Musicians' Influence (2010)

The number of nodes in Figure 1 is 689 (i.e. the number of musicians) and 811 edges (that is, the number of influencing mutual views of the family). In Figure 1, the main schools of musicians are represented by different colors, and the number of direct followers is represented by the size of

points. The larger the point, the more direct followers the musicians corresponding to the node.

## 3. Calculation of Musician Influence Index Based on Pagerank

Figure 1 shows the interaction between musicians. The influence of a musician is not only related to the number of musicians directly affected, but also to the importance of the influence on the musician. This is very consistent with the principle of PageRank algorithm developed by goole company. For a musician a, the PageRank calculation of the musician's influence is based on the following two basic assumptions:

(1) Quantity hypothesis: in the quantitative relationship graph of musicians, if a musician node receives more incoming links from other musicians, the more important the musician is.

(2) Quality hypothesis: the quality of the entry chain to musician a is different, and musicians with high quality will pass more weight to other musicians through the link. So the more high-quality musicians point to musician a, the more important musician A is.

So how to measure the quality of the chain? If musician t is influenced by musicians A and B at the same time, and musician S is influenced by musicians A, B and C at the same time, then for musician A, the quality of musician T is higher than that of musician S. Because musician A gets more weight (or score) from T.

Based on this, the score of musician A's influence is calculated as follows:

$$PR(A) = \frac{PR(T)}{L(T)} + \frac{PR(B)}{L(S)} + \cdots.$$

The PageRank value of is the number of outgoing chains. The score of musician a influence is a series of cumulative influence degree of musicians similar to T. See Figure 2 for specific calculation principle:
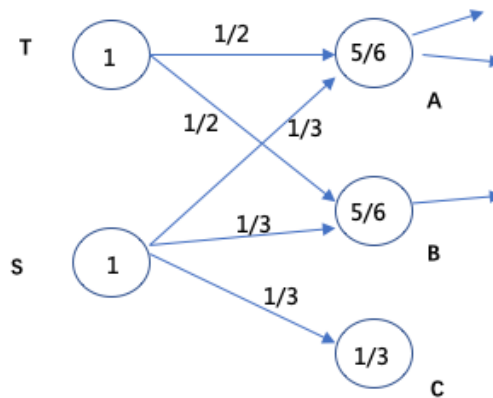


Fig.2 Schematic Diagram of Musician Influence Calculation

## 4. Musicians Influence Results

According to the directed network relationship subgraph constructed in Figure 1, the most influential musicians in 2010 are ranked as follows, as shown in Table 1.

Table 1 Top 10 Most Influential Musicians (2010)

| NAME | Pagerank Score | Top |
|---|---|---|
| Erykah Badu | 0.00519257 | 1 |
| Usher | 0.00480043 | 2 |
| Beyonc | 0.0038686 | 3 |
| Rihanna | 0.0035664 | 4 |
| D'Angelo | 0.00346403 | 5 |
| Michael Jackson | 0.00345972 | 6 |
| The Beatles | 0.00314335 | 7 |
| Aaliyah | 0.00313495 | 8 |

| Nina Simone | 0.00301521 | 9 |
| Miguel | 0.00297133 | 10 |

According to PageRank music influence model, the higher the PageRank value, the greater the influence of the musician. From table 3 above, the top 10 musicians with the greatest influence on musicians in the 2010's are Erykah Badu, usher and Beyonc, respectively_ Leakage, Rihanna, D'Angelo, Michael Jackson, the Beatles, aliyah, Nina Simone, Miguel.

The subnet method is applied to all years. Firstly, the directional relationship network of the interaction between all musicians from 1930 to 2010 is drawn, as shown in Figure 2.
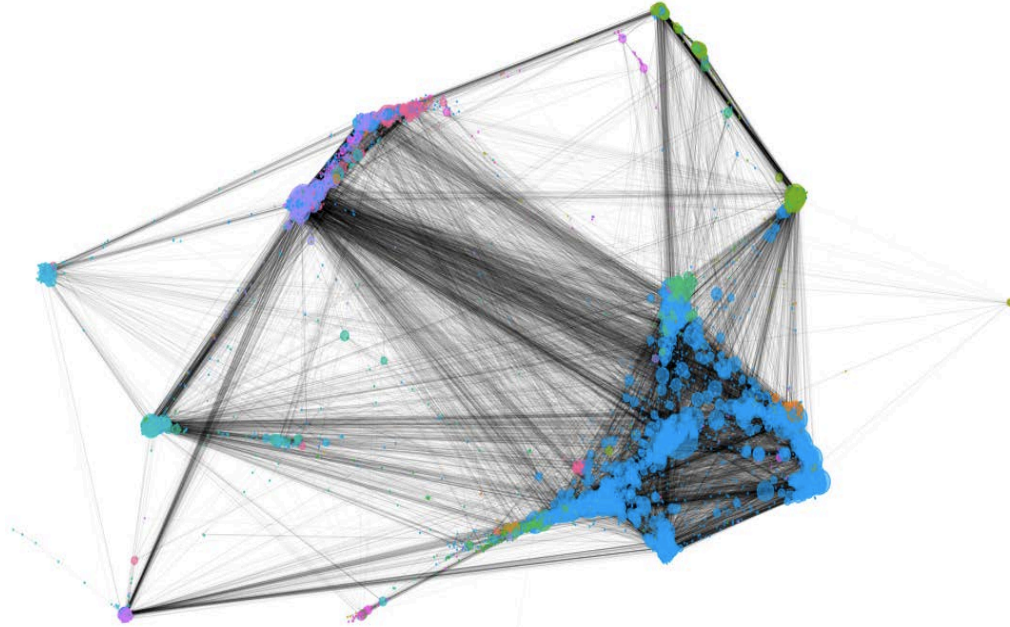


Fig.2 Musicians Directional Network (1930-2010)

As can be seen from Figure 2, a small number of musicians are at the core of the relationship network, and pop / rock schools account for a high proportion of musicians.

Table 2 Top 20 Most Influential Artists (1930-2010)

| vertices.name | PageRank | Top | | vertices.name | PageRank | Top |
|---|---|---|---|---|---|---|
| Cab Calloway | 0.02076 | 1 | | Roy Acuff | 0.00673 | 11 |
| Billie Holiday | 0.01965 | 2 | | Charlie Christian | 0.00673 | 12 |
| Lester Young | 0.01693 | 3 | | Muddy Waters | 0.00671 | 13 |
| Louis Jordan | 0.01361 | 4 | | Bob Dylan | 0.00570 | 14 |
| T-Bone Walker | 0.00999 | 5 | | Nat King Cole | 0.00561 | 15 |
| Sister Rosetta Tharpe | 0.00926 | 6 | | Billy Eckstine | 0.00513 | 16 |
| The Beatles | 0.00901 | 7 | | Woody Guthrie | 0.00494 | 17 |
| The Mills Brothers | 0.00771 | 8 | | Hank Williams | 0.00481 | 18 |
| Mississippi Fred McDowell | 0.00700 | 9 | | Chuck Berry | 0.00474 | 19 |
| Mississippi Sheiks | 0.00678 | 10 | | Son House | 0.00453 | 20 |

It can be seen from the above table that during the 80 years from 1930 to 2010, the top ten influential musicians were cab Calloway, Billie Holiday, Lester Young, Louis Jordan, T-Bone walker, sister Rosetta tharpe, the Beatles, the mills brothers, missippi Fred McDowell and missippi sheiks. By comparing with the top ten influential musicians in 2010, we can find that the Beatles is in the top ten, which shows that the music of the Beatles is constantly innovating and has a great influence on other musicians.

## 5. Conclusion

The research method and analysis results provide a new idea for the study of the interaction between musicians, help to dig out the musicians with real strength and influence, and provide help for the in-depth study of music and the characteristics of musicians.

## 6. Acknowledgement

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