POTENTIAL RELATIONSHIP DISCOVERY IN TAG-AWARE MUSIC STYLE CLUSTERING AND ARTIST SOCIAL NETWORKS

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Introduction

- Music style analysis such as music classification and clustering has become increasingly prevalent in music information retrieval research.
- Traditional methods usually focus on audio feature extraction and acoustic content analysis. More recently, methods utilizing music social tags have emerged [1, 2, 3, 4].
- Both content-based and tag-based methods make a somewhat curious assumption that music items are independent of each other, which is not always true.
- In our work, we assume that music items are related to each other and we utilize the “following” information on Twitter to construct a linked graph to represent the artist social network.
- Social tags and social network analysis are combined to establish relations among them by discovering relationships among artists.

Background

- Music social tags are free-text descriptions of any length with no restriction on the words to be used.
- Because they are free texts, they are thought of as representing feelings of listeners on the music items (artists, songs, etc.) for which they leave tags.
- They range from a single character (e.g., “!”) to a full sentence (e.g., “I love you baby, can I have some more?”).
- In many cases, they are one or two words, such as “Sad”, “Happy”, “Black Metal”, “Loved it”, and “Indie Pop”.

An example social graph generated from Twitter

Methodology

Framework

Artist Relation Matrix Generation
- Suppose that artist Ai is followed by a set of artists Fi, a matrix S to represent the direct relationships among the artists:

\[ S_{ij} = \begin{cases} \frac{1}{|F_i|} & \text{if} \, A_j \in F_i \\ 0 & \text{otherwise} \end{cases} \]

- To capture the indirect relationships, we perform a random walk on the directed graph denoted by S. The relation matrix can be computed as:

\[ B = (1 - \alpha)(1 - \alpha)S^{-1} \]

Factorization with Artist Relation Base Matrix

\[ \min_{B \geq 0, U \geq 0} \| X - BUU^T \|_F, \text{ s.t. } U^TU = I, V^TV = I \]

Computational Algorithm

Accuracy Results

Data

- 327 most popular artists of the following 5 styles: Pop (91 artists), Rock (67 artists), Country (55 artists), Jazz (48 artists), and Hip Hop (66 artists).
- The style information and tags of the artists are collected from Last.fm (http://www.last.fm).

Evaluation Measures

- Accuracy measures the relationship between each cluster and the ground truth class. It sums up the total matching degree between all pairs of clusters and classes.
- NMI [10] measures the amount of statistical information shared by two random variables representing cluster assignment and underlying class label.

Experimental Results

Implemented Systems

- K-means, Normalized Cut (Ncut) [5], Nonnegative Matrix Factorization (NMF) [6], Tri-factorization (Tri-fac) [7], Probabilistic Latent Semantic Indexing (PLSI) [8], PLSI+PHITS [9].

Conclusion

- This is a pilot study of incorporating social networking analysis into music style clustering.
- Experimental results on real world data demonstrate the effectiveness of the proposed method by integrating tags and social networking graphs in music style clustering.
- In the future work, we will discover other meaningful and useful types of information and examine if they can facilitate the task of music style analysis.

References


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