KV Multimedia Search and Retrieval

Exercise 1 Group E

FirstName Aaydi Luca Della Mura  
k12241884@students.jkut

FirstName Li  
 Department Name

Sara Scheucher

ABSTRACT

In this paper a rudimentary song-based retrieval system is being developed. Multiple different algorithms for computing the similarity between two songs are tested and compared with a random baseline. For calculating this similarity measure only text-features are used. This paper compares the cos-sim-similarity based on the tf-idf and word2vec respectively. This is contrasted with a measure using the transformer-based BERT.

1 Introduction

The increasing availability of digital libraries has paved the way for a new generation of music recommender systems. Music recommendation systems play a pivotal role in helping users discover new tracks, artists, and genres and thus drive customer satisfaction in a significant way.

The purpose of this paper is to evaluate and compare 4 different approaches to music retrieval systems. Within the scope of this paper all features are going to be text-based.

Concretely, the effectiveness of cos-sim-similarity based on both tf-idf and word2vec are compared to BERT.

The resulting recommendations will be evaluated qualitatively according to the similarity to the queried song.

The data set used for testing the 4 retrieval systems is a subset of the Music4All-Onion dataset which was kindly provided by the university.

2 Methodology

For implementing the assignment, the programming language Python is used as it has the most support for data analysis and data science purposes. The coding environment used is the notebook-based Google Colab. Mayor advantages of using Google Colab is that data intensive calculations can be done easily on every hardware using cloud technology. The code repository is hosted on the platform Github. The coordination and integration of code contributions of each team member is therefore ensured through the use of Git.

To ensure that new functionality as well as new algorithms can easily be added the text-based music recommender system in the future a large focus is set on making the code modular.

The input of the query is the name of the song as well as the name of the corresponding artist. The recommender system should output a list of songs with the title and the artist-

To be better able to analyze the results of the recommender system this output of the script is saved in a dictionary.

To keep the code modular and make it reusable we first implemented some basic functions in a separated python file. First, we defined a function to get the information about the artist and song name from the IDs. The function takes a list of ids as input and gives us the list of the songs and artist as the output. After that we implemented a function, which can be used for all text based analysis. The function itself is also called text\_based. It takes as input parameters the id of the query song, the representation of the lyrics for example the tf-idf, the number of tracks that want to be retrieved as well as the similarity function for example cosine similarity or Euclidean similarity. This way we are completely flexible and can use the same function for many different use cases.

2.1 The dataset

Music4All-Onion is a large-scale, multi-modal music data set, which expands the Music4All-dataset with additional features and meta-data. For the purpose of this task only the text-based features like “Title” or “lyrics” are considered.

[info about the the feature vectors]

[info about the two tsv files]

2.1 Random baseline

2.2 Cos-sim based on tf-idf

2.3 Cos-sim based on word2vec

2.3 Combination

3 Qualitative Analysis

For the qualitative analysis we selected 3 tracks for each retrieval system and retrieved 10 tracks for each query track:

3.1 Random baseline

3.2 Cos-sim based tf-idf

Query song 1: Love me by the 1975:

Result list:

|  |  |  |  |
| --- | --- | --- | --- |
| Song | Oh Yeah | Artist | Big Time Rush |
| Song | The Gospel | Artist | Alicia Keys |
| Song | Fire Starter | Artist | Demi Lovato |
| Song | Rat Fink | Artist | Misfits |
| Song | How Bad Do You Want It (Oh Yeah) | Artist | Sevyn Streeter |
| Song | Yeah! (feat. Lil Jon & Ludacris | Artist | Usher |
| Song | Regarde-moi | Artist | Céline Dion |
| Song | Miss Independent | Artist | Ne-Yo |
| Song | Euphoria | Artist | BTS |
| Song | Let There Be Love | Artist | Simple Minds |

In the result are songs of different genres like R&B, K-Pop, Pop, Indie-Rock, and Punk. The lyrics of the query song “Love me” have many appearances of the words “yeah” and “love”. By looking at the lyrics of the retrieved songs we noticed that all of them also have many appearances of the word “Yeah”. The songs “Let There Be Love” and “Miss Independent” also have many appearances of the word “Love”. Other than that, the query song, and the retrieved songs do not have so much in common and come from different genres.

Query Song 2: One by U2

Result list:

|  |  |  |  |
| --- | --- | --- | --- |
| Song | One | Artist | Mary J. Blige |
| Song | One Love (feat. Estelle) | Artist | David Guetta |
| Song | Love the One You're With | Artist | Stephen Stills |
| Song | One | Artist | Alanis Morissette |
| Song | No One | Artist | Alicia Keys |
| Song | One Tribe (Defqon.1 2019 Anthem) | Artist | Phuture Noize |
| Song | You Can Be the One | Artist | Late Night Alumni |
| Song | Rape Me | Artist | Nirvana |
| Song | Palavras No Corpo | Artist | Gal Costa |
| Song | No One in the World | Artist | Anita Baker |

For the second query song, we picked “One” by U2 which has been covered by Mary J. Blige, so it makes sense, that the cover version appears first in the result set because the lyrics are the same. We also have very different genres in this result set, The query song is a rock ballad, the retrieved songs are from the genres R&B, Grunge, EDM and Pop-Rock. There is also one Spanish song in the result.

Query Song 3: Every Christmas by Kelly Clarkson

Result list:

|  |  |  |  |
| --- | --- | --- | --- |
| Song | Christmas Conga | Artist | Cyndi Lauper |
| Song | Three Ships | Artist | Cyndi Lauper |
| Song | Hellhound On My Trail | Artist | Robert Johnson |
| Song | St. Patrick's Day | Artist | John Mayer |
| Song | Last Christmas | Artist | Carly Rae Jepsen |
| Song | My Only Wish (This Year) | Artist | Britney Spears |
| Song | Christmas Vacation | Artist | Descendents |
| Song | Last Christmas - Studio Version | Artist | Jimmy Eat World |
| Song | The Christmas Song (Merry Christmas To You) | Artist | Nat King Cole |
| Song | I Shut Doors and Windows | Artist | September Malevolence |

For the third query we wanted to analyze a Christmas song because Christmas songs usually have some specific words that are often used in the lyrics for example the words year, wish or mistletoe. As we can see in the result list, we retrieved 9 Christmas songs and 1 other song. The Song“I Shut Doors and Windows” by September Malevolence Is not particularly a Christmas song but it also has one appearance of the word “Christmas” in the lyrics

4 Results and Findings

Conference Name:ACM Woodstock conference

Conference Short Name:WOODSTOCK’18

Conference Location:El Paso, Texas USA

ISBN:978-1-4503-0000-0/18/06

Year:2018

Date:June

Copyright Year:2018

Copyright Statement:rightsretained

DOI:10.1145/1234567890

RRH: F. Surname et al.

Price:$15.00