

Real Time Multilingual Music Interpreter and Music Recommender System

Divyansh Bhagat, Kanishk Singh, Maksimjeet Chowdhary, Raghav Sharma, Shashank Singh
Group 54

Problem Statement

The problem of language barriers in music consumption has been a persistent issue for both music listeners and performers alike. With the global reach of music streaming services, there is an increasing need for a real-time multilingual music interpreter and recommender system that can accurately translate lyrics and music metadata and provide personalized music recommendations in multiple languages. Such a system could benefit music listeners by allowing them to access a wider range of music from different cultures and languages, while also helping artists to connect with global audiences. However, the development of such a system poses significant technical challenges, including the accurate translation of music lyrics and metadata, and the provision of personalized recommendations that take into account a user's language preferences, cultural background, and music listening habits. Therefore, the aim of this research paper is to explore the technical feasibility and potential benefits of a real-time multilingual music interpreter and recommender system, and to develop and evaluate a prototype system that addresses these challenges.

Motivation

The motivation for the project comes from the growing need to cater the growing exposure of listeners to different languages of entertainment content and the barrier it creates. People may enjoy the music but have no idea what they are listening to.

In addition, the development of such a system could have significant commercial benefits for music streaming services, as it could attract new users and increase engagement among existing users. This could lead to increased revenue for music streaming services, as well as new opportunities for artists and the music industry as a whole.

Overall, the motivation for this research paper is to explore the technical feasibility and potential benefits of a real-time multilingual music interpreter and recommender system

Literature Review

In this section, we review existing research on these topics, highlighting their strengths and weaknesses and identifying gaps for future research.

Real-time Language Translation

Real-time language translation systems have been studied extensively in recent years, with significant progress made in developing machine learning and natural language processing techniques. However, the accuracy of such systems is still limited, particularly in cases where there are differences in grammar, syntax, and semantics between languages. Research has also focused on the development of real-time speech-to-speech translation systems, which have shown promising results in certain scenarios but require further improvements to achieve widespread adoption.

Music Translation:

Music translation, which involves the translation of song lyrics and metadata, has also been studied extensively. Existing research has focused on the accuracy of automated music translation systems, which rely on machine learning and natural language processing techniques. However, the accuracy of such systems is still limited, particularly when it comes to translating idiomatic expressions, cultural references, and wordplay, which are common features in many songs. Some studies have also explored the use of crowdsourcing and human translators to improve the accuracy of music translations, but these approaches have their own limitations in terms of scalability and cost-effectiveness.

Music Recommendation System:

Music recommendation systems based on content have been extensively studied in the field of music information retrieval. Such systems rely on machine learning techniques to analyze the audio features of songs and provide recommendations based on similarities in musical content. However, these systems have limitations in terms that they can only recommend songs based on musical patterns, but not on content. A combined system which can recommend songs based on both musical patterns and content in the songs is another research avenue for the future.

Yet there are still significant technical challenges to be addressed, particularly in terms of improving the accuracy and scalability of such systems, as well as capturing the nuances of different music genres and cultural contexts. Future research should focus on developing more accurate and scalable systems that can address these challenges and improve the user experience in music consumption.

Novelty

Based on the literature review presented, it appears that the development of a real-time multilingual music interpreter and recommender system that integrates real-time language translation with music recommendation based on content would be a novel approach to addressing the language barriers in music consumption and improving the user experience. While there has been some research on real-time language translation and music recommendation systems based on content separately, the combination of these two systems in a real-time multilingual music interpreter and recommender system appears to be a new and innovative approach to addressing the language barriers in music consumption. Additionally, the development of such a system would require significant technical expertise and innovation to develop and integrate these systems seamlessly, making it a novel and challenging area of research. Therefore, there is a clear novelty in developing a real-time multilingual music interpreter and recommender system, which makes it a promising area of research for further exploration.

Methodology

We first load the dataset which contains songs' lyrics in a .csv format with the data manipulation tool, Pandas.

The data is preprocessed, lyrics are tokenized, lemmatized and stopwords are removed to get rid of inconsistencies in data (if any).

Approach for translation:

First, the user will input the song name and artist's name, which will be used to identify the relevant track. An external API will be used to then retrieve the lyrics of the identified track from a large database. The API must have a wide coverage of lyrics and support multiple languages.

Neural Network Translation: The retrieved lyrics will be fed into a custom-built neural network for translation. This neural network will provide more flexibility and customization in terms of language support and translation quality, since it can be trained on data similar to the use case (poem and other literature translations). Alternatively, a pre-existing API such as Google Translate API may be used. Finally, The neural network will generate the translated lyrics in the user's desired language, which will be displayed to the user

This provides a robust and efficient approach for enabling real-time multilingual music translation. The use of an external API for lyrics retrieval and a custom-built neural network for translation ensures wide coverage of lyrics and high-quality translations, respectively.

- *The API used for song retrieval is Musixmatch API.*

Approach for recommendation system:

The approach used for recommendation was content-based, which involved analyzing the content (lyrics) of songs to identify similarities in their themes or "gist". Based on this analysis, the recommendation system suggested songs that had similar themes or "gist" as the input song. This approach is different from collaborative filtering, which recommends items based on the preferences of similar users.

We then calculate the term frequency-inverse document frequency (TF-IDF) values for each term in the lyrics from preprocessed data. The resulting TF-IDF matrices are then stored in vector form to enable efficient and scalable analysis. Then cosine similarities are computed between the input song's retrieved lyrics (tokenized, lemmatized) and the preprocessed data. Top 'k' songs are returned to the user.

By choosing this approach we were able to recommend english alternatives to foreign songs after translation of lyrics

Database

The API and dataset used for user's song retrieval is [The musiXmatch Dataset](#)

Code

The entire codebase for the project done till now can be accessed from the GitHub repository below <https://github.com/shxwshank/Real-time-Multilingual-content-interpreter.git>

Evaluation

Relevance: A panel of judges/participants would rate the relevance of the recommendations based on their own subjective opinions

Serendipity: The panel of participants can also check in with the recommendations of songs that may have not been known to them initially, and may have missed out on lesser known artists, also showcasing the coverage of the system.

Efficiency: The system also needs to be efficient in its recommendation services.

We assessed the performance of song recommendation algorithms and the accuracy of translations, employing a survey-based approach. A sample of friends and colleagues were asked to rate the quality of the song recommendations on a scale of 1-3 and evaluate the correctness of the translations (binary response, yes or no) as well as provide a rating of the translations on a scale of 1-10. The findings of this study will contribute to the ongoing efforts to enhance song recommendation algorithms and improve translation accuracy in the music domain.

The mean score for quality of translations was 7, and the mean score for the quality of recommendations was 2.

[Link to the form.](#)