



The Book Bug

A Music to Book Recommendation System



Flow of Talk



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Problem Statement

To develop a music to book and book to book recommendation system with an interactive web interface on a model trained on LightGBM(Music Dataset) and Logistic Regression & OneVsRestClassifier(Book Dataset) after performing Word Embedding and Cosine Similarity for genre classification. The system will work for both English and Hindi Music.







Motivation



A cross-domain recommendation system that takes descriptions of music and books and recommends users based on similarity by various techniques and ML algorithms. It is useful for non-book readers who spend time on music streaming platforms, as it can help them inculcate a habit of reading and diversify their interests.





Literature Review






[1] Penha et al. studied the amount of factual knowledge stored in BERT transformer parameters and tested it with different probes to develop a conversational recommendation system.

[2] G. Ramakrishnan et al. developed a collaborative filtering system for a book recommender system, which included implicit information in user ratings and the similarities between items rated. The user ratings were assigned as a weighted average of all the similar book ratings.

[3] Ava Rana and K. Deeba developed an online book recommendation system that uses Jaccard similarity to measure similarity between users' preferences.

[4] Cho et al. compared 3 approaches to creating an efficient book recommendation system: content-based, collaborative filtering, and hybrid approach. The hybrid approach used the confidence levels of both approaches and performed their weighted sum to arrive at a result. The results showed that the hybrid model gave better results.





Literature Review

[5] Kaminskas et al. discuss techniques for context-aware music retrieval, including classical music information retrieval, recommender system techniques, emotion recognition in music, and social computing. It considers user-related context such as activity, demographics, and emotional state.

[6] N. Pelchat et al. covered how various NNs can be used to classify songs according to their genres. The input to the CNN was short time segments of the spectrograms of the songs. It had six convolutional layers followed by a fully connected layer and then a softmax function.

[7] Singh et al. released a new dataset comprising different Indian Song genres. An automatic genre classification model for Indian songs using machine learning. They compared the performance of different ML algorithms and concluded that the Light GBM classifier gives the best accuracy of 77.2%.

[8] Hungund proposed a machine learning model for genre classification of books by using multi label binarizer and Logistic Regression. The dataset used had 227 different types of genres.



Novelty

Developing cross domain music to book recommendation system using the timbral features of the song and then recommending books similar to the music



Database

1. Music dataset:
 - a. Hindi music dataset - 7 different genres
 - b. English music dataset - GTZAN dataset with 10 different genres
2. Book dataset - CMU book summary dataset including 16000 books along with its metadata



Methodology - Music to Book








- Extracted 12 essential features from each audio file using
 - Short frames of audio tracks
 - Pitch content of the music
- Extracted timbral features from the frequency of the audio signal
- Few features help better analyse the:
 - Relationship between musical pitches
 - Understand strengths of onsets in music
- Final database is prepared by concatenating csv files of audio tracks of each genre, containing 12 features and a label as genre for each song
- Model training for music genre classification using LightGBM giving 64% accuracy on the test dataset after splitting the above database into train set and test set in the ratio 80:20
- Used cosine similarity metric to map the genre of music to book genre
- Used Word embedding NLP technique to convert genres (words) to vector of numerical values
- Used pre-trained word embedding model named GoogleNews-vectors-negative300
- Used Word2Vec algorithm having a huge vocabulary to train this model
- Extracted the top book genres with maximum similarity with a particular music genre





Methodology – Book to Book

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- Built model that recommends books based on user's existing reading pattern
 - Decreasing the total set of genres (to keep the broader genres) by applying cosine similarity on the different genres.
 - Did feature encoding - each book can belong to multiple genres
 - Used the MultiLabelBinarizer to convert list of multiple labels to a binary label indicator matrix
 - Did data preprocessing - extracted book summary from the original dataset, remove stop words and punctuations
 - Trained the model using Logistic Regression model coupled with The OneVsRest classification strategy which helps a binary classifier to perform multi-class classification
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The background is a dark blue gradient. In the top left corner is a yellow star, and in the top right is a light blue star. At the bottom, there are stylized orange and blue leaf-like shapes on both sides, with small white plus signs and dots scattered around them.

Code

Refer Github Repository

https://github.com/smiti22073/CSE508_Winter2023_Project_19/tree/main/Final%20Project%20Deliverables



Evaluation

We have applied subjective reasoning to evaluate our system. For baseline results, individual accuracies for book genre classification and music genre classification had been calculated. As for the final system i.e. music to book, there is no publicly available dataset combining both music and book domains, we do not ground truth labels available to us. This results in us resorting to human evaluation for the evaluation of our system's results using cosine similarity to join both the domains. Accuracy for Book to Book - 11.7%; Music to Book - 64%; Hamming Loss for Book to Book is 0.07%.

**SOTA not available because of Research Gap.



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[8] Book genre classification reference: <https://www.analyticsvidhya.com/blog/2019/04/predicting-movie-genres-nlp-multi-label-classification/>
<https://www.kaggle.com/code/iamhungundji/book-summary-genre-prediction/notebook>

Thanks!

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