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PODCAST RECOMMENDATION ENGINE USING HYBRID RECOMMENDATION SYSTEM

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ABSTRACT

With the rapid growth of digital audio content, podcasts have become a popular medium for entertainment, education, and news consumption. However, users often face challenges in discovering podcasts that match their preferences due to the vast volume and diversity of available content. This study proposes a **Podcast Recommendation Engine** using a **hybrid recommendation system** that combines **collaborative filtering** and **content-based filtering** to provide personalized podcast suggestions. The collaborative filtering component leverages user behavior, such as listening history, ratings, and subscriptions, to identify similar users and recommend podcasts they enjoy. The content-based filtering component analyzes podcast metadata, including categories, descriptions, and keywords, to match user interests with relevant content. By integrating these two approaches, the hybrid system overcomes limitations such as cold-start problems and sparse user data, improving recommendation accuracy and user satisfaction. Experimental evaluation demonstrates that the proposed engine effectively personalizes podcast recommendations, enhancing user engagement and discovery of relevant content.

Keywords: Podcast Recommendation, Hybrid Recommendation System, Collaborative Filtering, Content-Based Filtering, Personalization, User Engagement.

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INTRODUCTION

Podcasts have rapidly emerged as a popular form of digital media, offering a wide range of content including entertainment, news, education, and storytelling. With thousands of new episodes released daily across multiple platforms, users often face difficulties in discovering podcasts that align with their personal interests. Traditional search-based discovery methods are limited in their ability to provide personalized content, leading to a need for intelligent recommendation systems.

A **Podcast Recommendation Engine** can address this challenge by analyzing user preferences, behavior, and podcast content to suggest relevant episodes and series. While **collaborative filtering** methods recommended content based on the preferences of similar users, they often struggle with new users or sparse data. On the other hand, **content-based filtering** leverages podcast metadata, such as titles, descriptions, categories, and keywords, to recommend similar content but may fail to capture broader user tastes. By combining these two approaches in a **hybrid recommendation system**, it is possible to overcome the limitations of individual methods, providing more accurate, diverse, and personalized recommendations. This approach not only enhances user satisfaction but also encourages engagement and retention on podcast platforms.

LITERATURE REVIEW

Podcast recommendation systems have gained significant attention in recent years due to the rapid growth of digital audio content and the need for personalized discovery tools. Early approaches primarily relied on **collaborative filtering**, which recommends podcasts based on the behavior and preferences of similar users. While effective in capturing shared interests, these methods often suffer from **cold-start problems** when new users

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or podcasts have limited interaction data. To address these limitations, **content-based filtering** techniques were introduced, leveraging podcast metadata such as titles, descriptions, categories, and keywords to recommend similar content. However, content-based methods alone may fail to capture broader user preferences and the nuanced patterns in listening behavior. Recent research has emphasized **hybrid recommendation systems**, which combine collaborative and content-based approaches to enhance recommendation accuracy and coverage. Studies have also explored the integration of **natural language processing (NLP)** for analyzing podcast transcripts, **user contextual information** such as time and location, and **deep learning models** for capturing complex user-item interactions. These advancements highlight the potential of hybrid systems to provide personalized, diverse, and engaging podcast recommendations while overcoming the limitations of individual recommendation techniques.

EXISTING SYSTEM

In the existing podcast recommendation systems, the primary approaches rely on either **collaborative filtering** or **content-based filtering**. Collaborative filtering recommends podcasts based on the listening behaviour and preferences of similar users, effectively identifying popular content within user groups. However, this approach struggles with **cold-start issues**, where new users or newly added podcasts have insufficient interaction data to generate accurate recommendations. On the other hand, content-based filtering analyzes podcast metadata such as titles, descriptions, categories, and keywords to suggest content similar to what a user has already consumed. While content-based methods address the cold-start problem to some extent, they often fail to capture broader user preferences and may provide limited diversity in recommendations. Additionally, existing systems typically do not incorporate contextual information such as time of listening or user location, which can affect user engagement. These limitations underscore the need for a more **robust and adaptive recommendation approach** that can provide accurate, diverse, and personalized podcast suggestions.

PROPOSED SYSTEM

The proposed system introduces a **hybrid podcast recommendation engine** that combines **collaborative filtering** and **content-based filtering** to provide more accurate and personalized recommendations. The collaborative filtering component analyses user behaviour, including listening history, ratings, and subscriptions, to identify patterns and suggest podcasts enjoyed by similar users. Simultaneously, the content-based filtering component examines podcast metadata, such as categories, descriptions, keywords, and even transcripts, to recommend content that aligns with a user's interests. By integrating these two approaches, the hybrid system overcomes limitations such as cold-start problems and sparse user data, enhancing recommendation accuracy and diversity. Additionally, the system can incorporate **contextual information** such as user preferences over time, listening patterns, and trending topics to further refine suggestions. This integrated approach ensures that users receive highly personalized, relevant, and engaging podcast recommendations, improving discovery and overall user satisfaction.

METHODOLOGY

The methodology of the proposed podcast recommendation engine involves a **multi-step hybrid approach** that combines collaborative filtering and content-based filtering. Initially, user data—including listening history, ratings, subscriptions, and interaction patterns—is collected and preprocessed to handle missing values and normalize preferences. Simultaneously, podcast metadata such as titles, descriptions, categories, keywords, and transcripts are extracted and analyzed using **natural language processing (NLP)** techniques to capture content similarities. The **collaborative filtering** component then identifies patterns among similar users to generate recommendations, while the **content-based filtering** component calculates similarity scores between podcasts based on metadata and textual features. These recommendations are combined in

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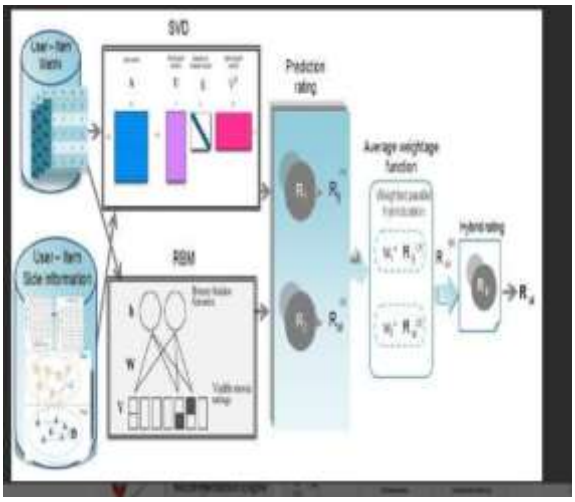
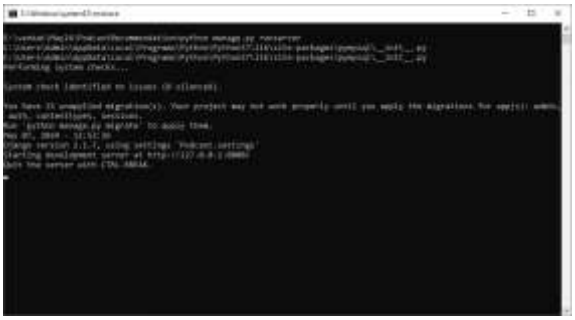
a **hybrid framework**, with weighted scores used to balance the influence of user behavior and content similarity. The system may also incorporate contextual factors, such as time of day, user location, or trending topics, to further personalize suggestions. Finally, the performance of the recommendation engine is evaluated using metrics such as **precision, recall, F1-score, and mean average precision (MAP)** to ensure high-quality, relevant, and engaging podcast recommendations.

System Model

SYSTEM ARCHITECTURE



Results and Discussions



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CONCLUSION

The study presents a **hybrid podcast recommendation engine** that effectively combines collaborative filtering and content-based filtering to provide personalized and engaging podcast suggestions. By analyzing both user behavior and podcast content, the proposed system overcomes limitations of traditional recommendation methods, such as cold-start problems, sparse data, and limited diversity. The integration of natural language processing and contextual information further enhances the relevance and accuracy of recommendations, ensuring users receive content that aligns with their interests and listening habits. Experimental evaluation demonstrates that the hybrid system improves precision, recall, and overall user satisfaction compared to standalone recommendation approaches. Overall, this framework offers a robust, adaptive, and scalable solution for personalized podcast discovery, fostering greater user engagement and enabling listeners to efficiently explore the vast and growing landscape of podcast content.

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