**Title: Movie Recommender System Using Machine Learning**

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**Abstract:**

In the age of information overload, it has become increasingly difficult for users to find relevant and enjoyable movies to watch. This mini-project aims to develop a movie recommender system using machine learning techniques to address this challenge. The system utilizes collaborative filtering and content-based filtering algorithms to recommend movies based on user preferences and movie attributes. The system is evaluated using various metrics, including precision, recall, and F1-score.

**Keywords:** Movie recommender system, machine learning, collaborative filtering, content-based filtering, evaluation

**1. Introduction:**

With the advent of streaming services and online video platforms, users now have access to a vast library of movies. However, this abundance of choices can make it difficult to find movies that are both relevant and enjoyable. Movie recommender systems can help users overcome this challenge by providing personalized recommendations based on their preferences and past viewing history.

**2. Proposed Movie Recommender System:**

The proposed movie recommender system utilizes a combination of collaborative filtering and content-based filtering algorithms. The collaborative filtering algorithm uses user-movie ratings to identify similar users and recommend movies that those similar users have liked. The content-based filtering algorithm uses movie attributes, such as genre, director, and actors, to recommend movies that are similar to movies that the user has liked in the past.

**3. Implementation:**

The proposed movie recommender system is implemented using the following technologies:

**Python:** The programming language used for development

**Pandas:** Data manipulation library

**NumPy:** Numerical computing library

**Scikit-learn:** Machine learning library

**Pickle:** Data serialization library

**Streamlit:** Web application framework

**4. Data Collection:**

The movie data used for training and evaluating the recommender system is collected from the TMDB API. The data includes movie titles, genres, directors, actors, and user ratings.

**5. Data Preprocessing:**

The movie data is preprocessed to remove missing values, inconsistencies, and outliers. The data is also normalized to ensure that all features are on a similar scale.

**6. Feature Engineering:**

New features are extracted from the movie data to represent the movies better. These features include the number of user ratings, the average user rating, and the release year.

**7. Model Training:**

The collaborative filtering and content-based filtering algorithms are trained using the preprocessed movie data. The trained models are then combined to form the hybrid recommender system.

**8. Evaluation:**

The effectiveness of the movie recommender system is thoroughly evaluated employing a variety of metrics, including precision and recall. To ensure accuracy, the resulting metrics of the evaluation indicate that the system successfully generates high-quality recommendations for users.

Precision measures the proportion of recommended movies that are actually relevant to the user's preferences.

Recall measures the proportion of relevant movies that are successfully recommended to the user.

Through comprehensive evaluation, the hybrid recommender system demonstrates its ability to identify and suggest movies that align with the user's interests, making it an effective tool for enhancing the movie-watching experience.

**9. Deployment:**

The hybrid recommender system is deployed as a web application using Streamlit. The web application allows users to select a movie and receive personalized recommendations.

**10. Conclusion:**

The proposed movie recommender system is a practical and effective tool for assisting users in discovering relevant and enjoyable movies. The system combines collaborative filtering and content-based filtering techniques to provide personalized recommendations. The evaluation results confirm that the system achieves high performance in recommending movies to users.