**MOVIE RECOMMENDATION SYSTEM FOR XMOVIES**

**Business Overview**

XMovies is a digital cinema company offering movies and TV shows on demand through a subscription platform. To enhance user satisfaction, engagement, and revenue, XMovies aims to develop a recommendation system. This system will provide personalized movie suggestions based on user ratings, increasing user retention and driving interaction.

**Problem Statement**

Customers of XMovies struggle to find new movies that match their interests, leading to decreased satisfaction and engagement. The current recommendation system is inadequate in analyzing user preferences and providing personalized suggestions.

**Project Objective**

***Main Objective:***

Build a movie recommendation system that provides the top 5 movie recommendations to a user based on their ratings of other movies.

***Specific Objectives:***

1. Enhance user satisfaction with accurate and personalized movie recommendations.

2. Improve user retention by delivering an engaging and satisfying experience.

**DATA EXPLORATION**

We used the MovieLens dataset, which includes:

- Movies: Information about 9,742 movies.

- Ratings: 100,836 ratings provided by 610 users.

- Tags: 3,683 tag applications.

- Links: Connection to external databases.

**Key Findings**

1. ***Genres***: The top 10 most produced genres are also the most rated genres, showing consistent user interest.

2. ***User Ratings***: The analysis showed diverse rating patterns among users, highlighting different tastes and preferences.

**Recommendation System Models**

**Collaborative Filtering*:***

1. ***SVD (Singular Value Decomposition):***

- Captures hidden factors in user-item interactions.

- Achieved the best performance with the lowest prediction error.

2***. KNN-Based Models***:

- Utilizes similarity between users or items.

- Competitive but slightly less accurate than SVD.

**Hybrid Approach**:

Combines collaborative filtering with content-based filtering to use both user-item interactions and movie attributes. While initially showing higher error rates, it has potential for diverse and improved recommendations with further tuning.

**Best Performing Models**

***1. SVD:***

- Best for accuracy in predicting user ratings.

***2. BaselineOnly:***

- Also showed strong performance with similar accuracy to SVD.

**MODEL TUNING AND OPTIMIZATION**

To ensure the recommendation system delivers high-quality suggestions, several tuning and optimization steps were undertaken:

1. ***Parameter Tuning***:

- For models like SVD and KNN, various parameters were adjusted to find the optimal configuration.

- Parameters such as the number of factors in SVD and the number of neighbors in KNN were experimented with extensively.

2. ***Cross-Validation***:

- A technique used to evaluate the effectiveness of the model by splitting the data into training and testing sets multiple times.

- Ensured that the model performs well on unseen data and is not overfitting.

3. ***Regularization***:

- Applied to prevent overfitting by adding a penalty to the model's complexity.

- Helped in balancing the model's ability to generalize versus memorizing the training data.

4. ***Hyperparameter Optimization***:

- Involved searching through a range of values for each hyperparameter to find the best combination.

- Techniques such as Grid Search and Random Search were employed.

5. ***Evaluation Metrics***:

- Various metrics such as Root Mean Squared Error (RMSE) and Mean Absolute Error (MAE) were used to measure the model's performance.

- Aimed to minimize these metrics for the best results.

CONCLUSION

The SVD and BaselineOnly models emerged as the most effective strategies for the recommendation system. These models offer a good balance between accuracy and efficiency.

RECOMMENDATIONS

1. ***Implement SVD or BaselineOnly Models***: These models have shown the best accuracy in predicting user preferences.

2. ***Further Tuning***: Continuously refine these models to enhance user satisfaction and engagement.

3. ***Explore Hybrid Models***: Invest in improving hybrid models to offer diverse recommendations and cater to varied user tastes.

By focusing on these strategies, XMovies can significantly enhance its recommendation system, leading to increased user satisfaction and engagement on the platform.