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General Purpose Recommendation System

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Abstract: *A recommendation system is a class of information retrieval systems that provides personalized suggestions to users. Our approach is to generalize the process of creating a recommendation system so that it can be used effectively in multiple domains. This approach can be achieved by collaborative filtering by using the website's clickstream analytics. Data related to user clicks can easily be extracted and this data's use is limited to analyse the user behaviour. We can use this extracted data to generate recommendations for the users and increase engagement on the website. The identifiers of users and items can be passed along with the user click rate to a supervised machine learning model of matrix factorization. We are using alternating least square (ALS) to predict the recommended items. The suggested system interfaces with the client system using a web API which will collect data and generate recommendations.*

Keywords: Collaborative Filtering, Clickstream Analytics, Matrix Factorization, Alternating Least Square

I. INTRODUCTION

A recommendation system is a type of machine learning algorithm that suggests items, products, or services to users based on their preferences, past behaviour, and interests. These systems have become increasingly popular and are now widely used in a range of applications such as e-commerce, social media, and entertainment. The primary goal of a recommendation system is to improve the user experience by providing personalized recommendations that are tailored to their individual tastes and preferences.

Recommendation systems use a range of techniques to make their predictions, including collaborative filtering, content-based filtering, and hybrid filtering. Collaborative filtering methods rely on user behavior data to find similar users and recommend items that the target user has not yet consumed. Content-based filtering methods consider the attributes of items and recommend similar items to those that the user has previously liked. Hybrid filtering combines both collaborative and content-based methods to overcome the limitations of each approach.

Overall, recommendation systems play a crucial role in providing users with a personalized experience in a world that is increasingly inundated with information. They enable users to discover new products, services, and content that they might not have otherwise known about, and help businesses to increase customer engagement and revenue. As such, the development and refinement of recommendation systems are an active area of research in machine learning and artificial intelligence.

II. LITERATURE SURVEY

The research paper "Hybrid Collaborative Filtering Recommendation Algorithm for ALS Model Based on a Big Data Platform" proposes a recommendation algorithm for e-commerce websites that combines collaborative filtering and content-based filtering techniques. The authors first preprocess the data and then apply the ALS model to generate user and item latent factors. The authors then use a hybrid approach that combines the item latent factors with content-based features to make personalized recommendations. The content-based features are obtained by analysing the text data associated with the items, such as the item descriptions and reviews.[1]

This paper discusses several existing approaches for handling implicit feedback data. One such approach is the weighted matrix factorization (WMF) method, which assigns weights to the observed interactions based on their confidence levels. Another approach is the Bayesian personalized ranking (BPR) method, which optimizes a pairwise ranking loss function based on the observed interactions. The paper provides a comprehensive review of existing CF(Collaborative filtering)methods and matrix factorization techniques for recommendation systems. It also presents a

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novel approach to addressing the challenges of using implicit feedback data, and provides empirical evidence of its effectiveness. The proposed regularization parameter estimation method is also a valuable contribution to the field.[2]

Matrix Factorization is a effective method to give recommendations as it predicts user behaviour based on his interactions. Most of the user-item matrices are sparse and dimensions increase rapidly which results in reduced accuracy and increase in calculation time. This paper proposes a matrix decomposition model based on user characteristics which improved accuracy and reduced number of iterations. They have tested their model on movie lens dataset and has better values for RMSE and MAE than other algorithms like Basic MF, Regularized MF, Non-Negative MF, SVD++. [3]

The proposed algorithm provides a new approach to CF that considers users' preferences for item attributes. By incorporating attribute ratings into the similarity calculation, the algorithm is able to generate more personalized and diverse recommendations. The results of the evaluation demonstrate the effectiveness of the proposed algorithm in a real-world setting.[5]

III. PROBLEM STATEMENT OF THE SYSTEM

To develop a general-purpose recommendation system that will identify the most relevant item irrespective of its background, will be easy to integrate in the current or new systems and will provide real-time recommendations.

IV. IMPLEMENTATION DETAILS OF THE SYSTEM

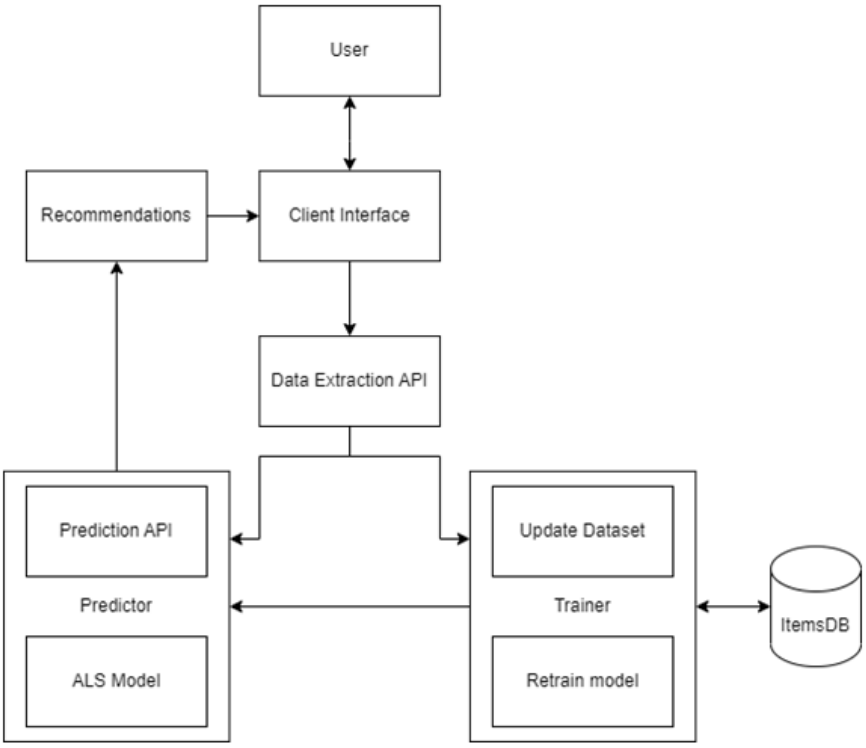

Figure: System Overview Diagram

The proposed system contains following:

4.1 Data Extraction

The system will extract the user data from the client's website to generate recommendations as well as re-train the model. This extracted data includes the user click activity and conversion rate of an item. The attributes are user's id, item's id and conversion or click rate.

4.2 Building the Classification Model

Recommendations will be generated by a supervised machine learning algorithm of matrix factorization: Alternating Least Squares (ALS).

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4.3 Working

API end-points can be called to get recommendations based on item's id. This API will return the latest dumped model's predictions. The new extracted data will be sent to the message queue. After N units of data is collected, this batch of data will be used with the previous collected data to retrain the model. This newly trained model will replace the old model. API end-points can be called to get recommendations based on item's id. This API will return the latest dumped model's predictions. The new extracted data will be sent to the message queue. After N units of data is collected, this batch of data will be used with the previous collected data to retrain the model. This newly trained model will replace the old model.

V. CONCLUSION

After reviewing the various approaches to building a recommendation system it became evident that collaborative filtering is the best approach to implement a General Purpose Recommendation system. Using a purely user preference based approach, General Purpose Recommendation system is implemented. ALS is faster and more scalable than weighted matrix factorization, particularly for large sparse matrices. Moreover, ALS is well-suited for handling implicit feedback data, where users do not explicitly provide ratings but their behavior (e.g. clicks, purchases, views) can be used as a signal for preference, while BPR is primarily designed for explicit feedback data. The algorithm can produce more individualised and varied recommendations by factoring attribute ratings into the similarity calculation. The evaluation's findings show how useful the suggested algorithm is in practical situations.

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