Recommendation Systems

Akbarzhon Madaminov
Faculty of Informatics and Computer Engineering
Innopolis University
Innopolis, Russia
a.madaminov@innopolis.university

***Abstract*—This document describes Recommendation system, their types and why it is important to integrate such a system to the applications that we use in our daily life. And this paper is about how to help people to make choices they will not regret.**

***Index Terms*—Recommendation system, Collaborative filtering, User based, Item based, Hybrid**

I. Description

Nowadays, Recommendation System is a part of daily life in which people rely on knowledge to make decisions that are in their best interests. A recommendation system integrated to any kind of applications helps users to filter the information and predicts user preferences for items they use. There are several ways to implement such a system. It could be user based, which recommend items only from the similar users or using the relation between the items. Different algorithms and approaches are provided, which may use rating or content information.

II. Originality and Impact

Despite the fact that many approaches have been developed in the past, investigation continues to exist due to its frequent use in many applications that personalize a recommendations. As the system rely on users implicit or explicit feedback, it can make more precise prediction that we can observe in [1]. It is important because people spend their scarce resources, like time, money etc., to find an appropriate option and making choices. Also there is a big benefit not only for users, but for suppliers too. If recommendation system allows users to be more productive while making purchases and finding some needs, then producers will be able to exactly know what consumers want and finding more suitable product for them.

III. Description of paper

Traditional collaborative filtering recommendation is one of the most widely used algorithms in today's recommendation systems, and it's also the industry standard in e-commerce. There is a descriptions of a traditional recommendation system and their different improvements in the referenced papers [1], [2] and [3].

IV. Why it is suitable for our problem

Users with similar interests will have common interest bias in the future, according to the core idea of collaborative filtering. The classic collaborative filtering algorithm, on the other hand, has several issues: (1) insufficient confidence based on user interest bias similarity; (2) failure to account for the time component; (3) absence of correlation between behaviors. Hence, in this paper described algorithms improved from the traditional solution of our problem. According to the Pigeonhole principle, considering that all items can be classified into small groups and having user's history of choices made, there are always a group of people with similar requirements and needs for the products. And our problem now is converted to find like-minded users in order to make a suggestion more precise.

V. Implementation

Firstly we will determine favourites and needs of the user as described in [1], considering time decay factor, frequency and combination. We can denote this value as $freq_{user}$. In the next step, we will use modified version of KNN (K-nearest neighbor) algorithm by finding the similarity factor between the users $sim(user_1, user_2)$ mentioned in [1], [2] and [3]. So pairs of users with the highest values by this function will be denoted as neighbors - $neib_{user}$. Then we need to split our dataset (e.g. history of purchase) into train and test parts. We can use validation dataset to tune the hyper-parameters, which could be (1) number of neighbors to consider, (2) frequency factor, etc. We choose Mean Absolute Error to evaluate the system. This is one of the most commonly used evaluation indicators in recommendation systems. And in the final stage we will calculate the predicted score of user on the items, denoted as $rate_{user,item}$. Now we can use this value in order to suggest product to the users. Mostly our dataset will consist of big amount of data, so we need to deal with them, by dividing into independent calcualtion and using parallel clustering with Hadoop as described in [3].

VI. Evaluation of the system

It can be seen from the experiments result part from [1], that by this implementing of algorithm we can reach lower MAE results and set the best individual parameters according to the company, product type and for different kind of dataset.

Also experimental evidence shows that adding fluctuations to traditional collaborative filtering not only takes degree of user preference for dynamic changes into consideration, but also future optimizes collaborative filtering

REFERENCES

[1] J. Yu, J. Shi, Y. Chen, W. Liu, K. Liu and Z. Xie, "Enhancing Collaborative Filtering Recommendation by User Interest Probability," 2021 4th International Conference on Artificial Intelligence and Big Data (ICAIBD), 2021, pp. 525-529, doi: 10.1109/ICAIBD51990.2021.9459028.

[2] J. Yu et al., "Collaborative Filtering Recommendation with Fluctuations of User' Preference," 2021 IEEE International Conference on Information Communication and Software Engineering (ICICSE), 2021, pp. 222-226, doi: 10.1109/ICICSE52190.2021.9404120.

[3] S. D. Raj, "Automated service recommendation with preference awareness: An application of colaborative filtering approach in big data analytics," 2017 2nd International Conference on Communication and Electronics Systems (ICCES), 2017, pp. 766-769, doi: 10.1109/CESYS.2017.8321186.