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Intelligent Health and Education Trust Recommendation System

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Abstract: ***Nowadays there is rapid growth of the Internet & Smartphone users and the magnitude of the applications depending on the internet. Every day we hear or read about issues like an individual is not able to study further or able to pay for treatments of various diseases due to financial weakness. Even though there are various organizations and trusts that provides different facilities regarding health and education to the poor seeking for financial help and there are several messages regarding such organizations that are forwarded over social networking sites and messaging applications, but still some people are not able to receive those facilities due to lack of a centralized system. So the aim is to propose a system- The Intelligent Health and Education Trust Recommendation System (IHERS) which will categorize health and education charitable trusts in a centralized manner and it will highlight the availability of funds to the users availed by several organizations. So the IHERS will contain modules such as Health, Education, Posts and a module for upcoming events and it will analyze the users rating based on recommender system which will be supported by Collaborative Filtering. Recommender system will be based on information about user's rating given to a hospital or NGO in general and recommend the organizations or hospitals based on their ratings to the users. Collaborative filtering provides a way for recommendations on the web.***

Keywords: Intelligent Health and Education Recommendation System (IHERS), Collaborative Filtering (CF), Centralized System;

1. Introduction

As mobile phones have become increasingly powerful and prominent in everyday life, their potential to be used to improve healthcare in daily life also increases due to the increase in the number of internet users. The statistic of how data became big epochs back to seven decades when the first phenomenon of information explosion was recorded [1]. Mobile health apps targeting the end user are a reality: food recommendation systems, medication reminders and skin cancer detectors are examples of such applications. But it is possible to extend the usefulness of mobile computing applications to healthcare providers by creating a system to help the needy people who need funds for their treatment. Today if anyone needs funds for health related purpose, they have to search on individual sites for it. Also many students can't follow their dreams because of financial problem, so sometimes they cannot get funds on time. Let's take a scenario; a patient is in need of funds for his treatment so at that time searching for instant funds will be difficult and there might be a chance that the patient won't get funds. There are many trusts for health and education but then also most of the needy people will not get funds. This may be because of lack of awareness about the organizations. People throw used medicines which are not expired but they don't know about the NGO's which collect those medicines and give it to poor people. Many hospitals like the "Nargis Dutt Memorial Cancer Hospital" which admits the patient who have some specific disease like cancer. So the project on health and education organizations focuses on the awareness and conditions for funds. The contributions of this paper stem from the projects themselves, but also from the lessons learned that will hopefully help organizations.

2. Literature Survey

Zhiyang Jia[2], Wei Gao et al has proposed a suitable recommendation method with the help of Collaborative filtering for use in a Recommendation System Based on Tourist Attraction to provide personalized tourism information to its users. Suppose that users with similar interests should favourite to the same items as each other. So, as long as the maintenance of a database on the user's preference, the neighbour users with similar interests can be calculated by analysing the stored preference, and then it can be recommended to the user based on the neighbour users' interest. The goal of this technique is to recommendations of attractions are generated according to make certain decisions for development desired place. Visiting times of neighbours are used to compute the recommendations of attractions. According to the calculation above, we know that the neighbours of tourist T1 are T2 and T3, so we can list all the visiting history of all the attractions so as to summary the most popular ones. As listed in Table 1, we can find that the maximal visiting times of neighbours are attraction A3 and attraction A4. As a result, attraction A3 and attraction A4 should be presented to tourist T1 as recommendations.

The diamond recommendation system was presented by Kunyanuth Kularbphettong, SunisaSomngam et al in [3] by using K-Means and Collaborative Filtering techniques. The prototype system suggests users automatically in order to maximize users' satisfaction. The system design and development will be in the form of Android (android operating system). The initial results showed that their approach had successfully generated the recommendation results matching with the group of users. As for the future work, they need to explore more reasonable other technologies to apply in this project to enhance the quality and quantity of services to users. K-means is one of the simplest unsupervised learning algorithms for clustering data. The procedure follows a simple and easy way to classify a given data set through a certain number of clusters fixed a priori. In this project, they collected data from 150 users and each user was asked to fill out user's personal profile including age, gender, and income, type of jewellery, style,

diamond shape and preferences. K-means was used to cluster into 3 groups of users. The calculations done by Collaborative filtering gives the similarity among each user and it selected a user that is similar to the current users from finding the similarities and then the rating data is processed to predict the value prediction. Finally, the system will present the results by selecting from the highest rating for the current user.

R. Shanmugalakshmi, Veningston. K in [4]. have proposed a system which analyze the location-aware reviews, so as to understand the experiences of community user and further it is matched with a specific user search preference to suggest preferable locations for meeting their goal especially when they visit a new place. The idea was to infer user's preferences and thus to recommend nearby locations such as hospitals, food courts, shopping and so on. User's current search contexts are rarely considered by the well-known location recommendation system named FOURSQUARE. The main aim of Personalization in Location Recommendation system is that to present the users with what they need without the need to ask for it explicitly. This means that a personalized system must somehow infer what the user requires based on either previous or current interactions with the user. An enrichment technique of location recommendation system by the use of personalization has been showed and the technique has been tested on various health reviews extracted from a social network to recommend hospitals. The potential health care applications have also been investigated.

Haifeng Liu, Zheng Hu, et al., in [5] have published a paper on user similarity model to improve the accuracy of collaborative filtering. This paper focuses on the recommended performance in memory-based collaborative filtering algorithms. The core of collaborative filtering is to calculate similarities among users or items. The traditional similarity measures, such as the Pearson's correlation coefficient, cosine, mean squared difference, are not sufficient to gain or capture the effective similar users, especially for a inactive user who only rates very few number of items. This paper presents an improved heuristic similarity measure model. The new similarity model combines the local context for common ratings of each pair users and global preference of each user ratings. In order to test and verify the new similarity measure, experiments are implemented on three most used real data sets. In comparison with many state-of-the-art similarity measures, new model can show better recommended performance and better utilizes the ratings in cold user conditions. To improve the accuracy, many researchers have proposed some new similarity measures. Ahn [6] proposed a new similarity for collaborative filtering that is called PIP (Proximity-Impact-Popularity). The paper analyzes the drawbacks of the Pearson correlation coefficient and cosine similarity. This similarity considered the three aspects: popularity, impact, proximity of user ratings. But, this similarity considers only the local information of the ratings and does not consider the global preference of user ratings. The paper first analyzes the disadvantages of the existing similarity measures. In order to overcome these shortages, a novel similarity measure approach is proposed, which is based on the PIP measure. The initial PIP similarity is not normalized and the computing is complex. Hence, the paper proposes a new similarity model to overcome these shortages. Moreover, the improved similarity measure takes the proportion of the common rating between two users into account.

Ji Liang-hao, Li Lin-hao in [7] have proposed a new recommender model of collaborative filtering based on user. CF is also named as social filtering, which bases on the following assumption: if some users share similar views to some items, then they share similar rating to other items too. The main idea is that the target user is likely to enjoy the items which other users with common interests. Therefore, finding the neighbours of target user's is the key step of CF.

In this paper, the authors have proposed a user-based collaborative filtering model. The results of experiment show that the model can improve the two problems which are data sparsity and scalability problem that were efficiently faced by traditional collaborative filtering. The quality of information recommendation also has the distinct enhancement compares to the traditional recommendation.

Ping SU and HongWu YE in [8] have proposed an item-based collaborative filtering recommendation algorithm which used the prediction of rough set theory in this paper. The technique uses rough set theory to fill in the empty ratings of the matrix where necessary. Then it utilizes the item based collaborative filtering to produce the recommendation. The experiments were made on a common data set using different filtering algorithms. The results shows that the algorithm which merges rough set theory and item based collaborative filtering can be used to increase the accuracy of the collaborative filtering recommendation system. In this paper, the authors compare the proposed CF that combining the rough set theory and the item based CF with the only utilizing the user based CF. As showing in the Figure 1, it includes the decision support accuracy metrics of ROC-4 for the two comparing methods in relation to the different numbers of recommender items. The obvious conclusion is that the combining method is better than only using the user based CF.

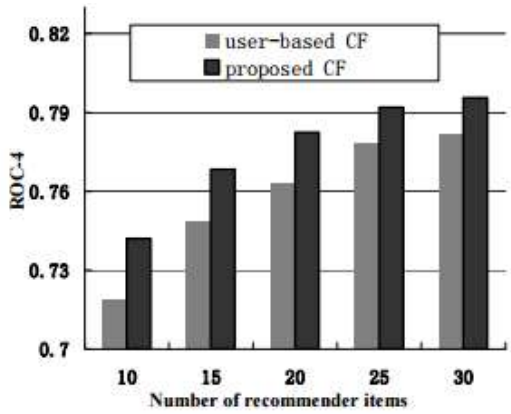

Figure 1: Comparing the proposed CF with the user based CF [8]

The result shows that the recommender algorithm which merges item based collaborative filtering and rough set theory and can increase the accuracy of the collaborative filtering recommendations system.

3. Proposed System

This system basically consists of three modules namely health care module, education grants and a module for posts in which people that are in need of financial aid can post their requests. The system will consist of a client side Android mobile application connecting to the remote server; server will be integrated with a database which will store the information about all the Organizations, the posts and information about the user, etc. The system will also consist of a web portal for the admin to update the contents displayed to the users of the app.

A. Health module

This module will recommend all the Organizations and hospitals that provide various health care facilities like operations at affordable rates, lab reports at low cost, funds for treatment, etc based on the users search pattern. Also, many times medicines of packet remains unused but which are not expired, so there are some organizations which recycle those medicines and bring them into use. So it will also recommend all those organizations which recycle such medicines.

B. Education module

This module will recommend all the government and non-government organizations that provides all the necessary help like financial help for students who are willing to study but cannot afford it, study material at a low price, etc.

C. Posts

Along with searching for organizations, the user will also be able post about their needs along with their contact details on the posts section. And if an individual/organization wants to help the needy then they can check the Posts module to check for posts made by people and contact them.

D. Events

This module will recommend all the upcoming medical camps like blood donation camp, health check-up camp, etc.

The system's backend will have a SQL Server DB/Firebase. The Admin will be able to make updates to the system through the web portal like Add a new Organization in the Health or Education module, view the list of registered users with the app, add new events to be displayed in the event notification section of the application. The figure below illustrates the block diagram for the system.

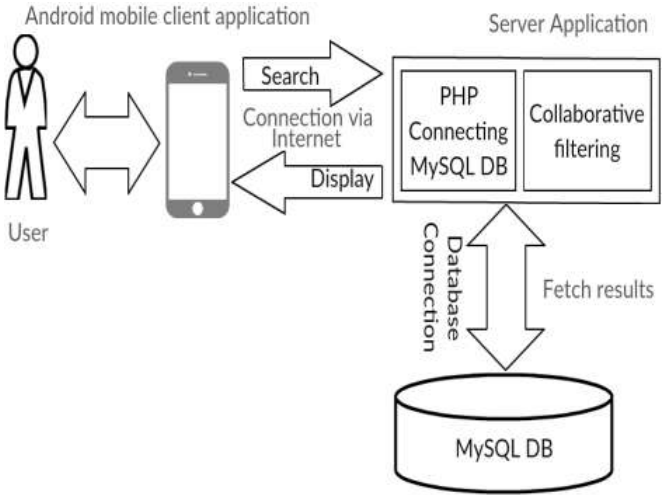

Figure 2: Block Diagram of IHER

As illustrated in Figure 2, the user will search the organizations/trusts through the application. The server side will query the request onto the database and the database will return results according to the given query. With the help of Collaborative filtering, other related results are also displayed to the user.

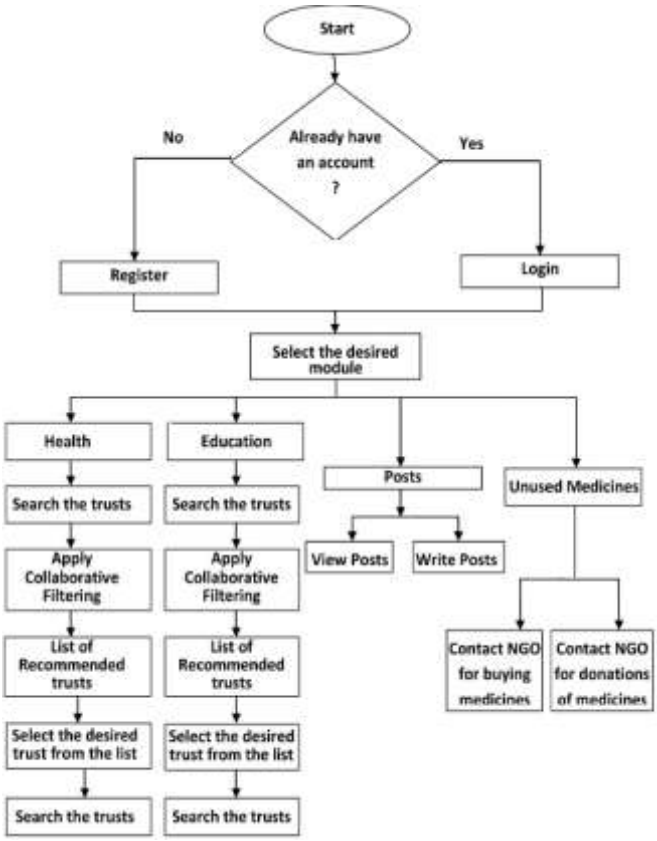

Figure 3: Flowchart of the system

Figure 3 illustrates the steps of the proposed system, after opening the application the user will register if the user does not have an account. After this step, four modules of the application will be visible to the user and he can select the module according to his needs. If the user opens the health and education module, the list of various organizations will be visible to the user. In the posts section the users will be able to post their requests. If any user wants to donate some unused medicines or buy such medicines in less cost then the

user can contact the organizations from the 'Unused Medicines' section which will be present in the Health module itself.

4. Alogrithms and Models

When the user will use the system, user will search according to the needs. So the next time the user opens the application the user should first find the results related to what user wants or has searched before. This is achieved using Collaborative Filtering. Collaborative Filtering is one of the significant techniques used in recommender systems [9]There are two types of collaborative filtering: user- based and item-based. Item-based collaborative filtering is a model-based algorithm for making recommendations. The similarities between various items of the data-set are computed by using the similarity measures and then further these similarity values are used to predict the ratings for user-item pairs not present in the dataset.

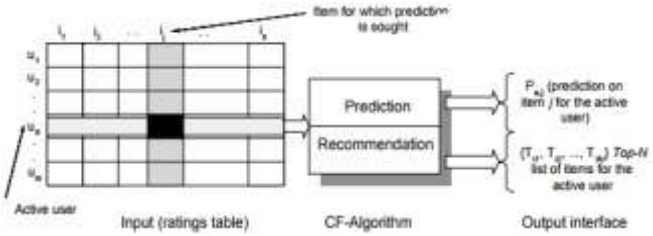

Figure 4: Collaborative Filtering Process[9]

Figure 4 shows the collaborative filtering process diagram. The Collaborative Filtering algorithm represents the entire *m x n* user-item data as matrix A of ratings. Each entry a_{ij} in *A* represents the preference score (ratings) of the ith user on the jth item. Each individual rating is within a numerical scale and it can as well be 0 indicating that the user has not yet rated that item. A number of collaborative filtering algorithms have been devised by researches and they can be divided into two main categories-Memory-based (user-based) and Model-based (item-based) algorithms. In the proposed system the collaborative filtering process can be used in a similar fashion. If two users x and y have same preference score on a particular trust and the next time x likes or rates an organization, that organization would be recommended to the user y, this is the user based collaborative filtering process. In item based collaborative filtering process, if user x searches for an organization then the results will also include other organizations that are similar to the keyword in some or the other way.

5. Conclusion and Future Scope

The Intelligent Health and Education Trust Recommendation System can be helpful to the people who need financial aid regarding medical or educational needs. It can also increase the awareness of the organizations that provide financial aid to the needy.

Along with the current features of the system, we can add some more advanced features in future. The appointment system can be integrated along with the Recommendations System.

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