Collaborative Recommendation System in Users of Anime Films

A S Girsang1*, B Al Faruq1*, H R Herlianto1* and S Simbolon1*

1 Computer Science Department, BINUS Graduate Program-Master of Computer Science, Bina Nusantara University, Jakarta, 11480, Indonesia

*Email: agirsang@binus.edu, barra.faruq@binus.ac.id, hemdani.herlianto@binus.ac.id, sihar.simbolon@binus.ac.id

Abstract. The recommendation system is one method to know the preference consumer by showing the potential object. This recommendation also helps the consumer gets the preference object. One of the popular objects in the recommendation is anime film. In this case, we conduct research to recommend anime films based on ratings of previously watched films. Collaborative filtering is a technique that consists of calculating similarities, predictions, and recommendations. This study is taken from dataset Kaggle which consists of 73,516 users and 12,294 anime. A user’s history will be matched with the whole user’s history with alternating least squares (ALS) method. The anime will be recommended based on that results. This method is expected to help millions of users find the desired anime.

Keywords: Recommendation technique, collaborative filtering, prediction, anime

1. Introduction

With the development of technology, all forms of activities can be done digitally. Some information in cyberspace more and more with the growth of the internet in real-time which records every information received. As a consequence, much information is uncertain. It makes consumers or users are hard to find their preference because the information can be irrelevant to them. The recommendation system aims to resolve this problem. With a recommendation system, one can quickly access relevant information without searching manually. Many websites today benefit from a recommendation system for promoting and selling their products such as movies, hotels, restaurants, food and so forth. The recommendation can be built based on user profiles social media or track history in online stores which knows the user’s behavior.

The recommendation system helps users to determine items that might be used. In terms of anime and manga, anime and manga versions are increasingly appearing with an interesting story and series quality. this will make it difficult for users to determine which movie to watch first. Collaborative filtering is a technique that is often used because it only relies on ranking data from previous users to be able to predict recommended films [1]

In this paper, we propose the use of a recommendation system using collaborative filtering (CF) to recommend anime. CF [2], which is one of the most popular techniques used wildly for recommendation systems. A simple recommendation system is used to measure the similarity between shows, users and helps to predict whether users will enjoy certain anime.
2. Related work

Many types of research about recommendations have been conducted using collaborative, content-based and hybrid both of them. Dev, in his research, uses a big data platform with MapReduce to develop a collaborative reconciliation system [3]. This system is able to reduce costs by removing the redundant computational process. Kumar [4] proposes a film recommendation system using collaborative filters that focus on the ratings given by users to provide recommendations. This allows the user to choose his choice from a given set of attributes and then recommends him to list the films based on the cumulative weights of the different attributes use algorithms k-means to recommend films based on the highest order. Shahjalal et al [5] implement a reconciliation system that combines both collaborative and user-based filtering approaches based on items. Researchers use the KUNN algorithm, a new algorithm for collaborative screening of one class, a setting that includes many applications.

3. Proposed method

3.1. Problem formulation

Table 1. Movie ratings by users.

| Movies | User A | User B | User C | User D |
|--------|--------|--------|--------|--------|
| P      | 5      | 5      | 1      | 1      |
| Q      | 5      | ?      | ?      | 1      |
| R      | ?      | 4      | 1      | ?      |
| S      | 1      | 1      | 5      | 4      |
| T      | 1      | 1      | 5      | ?      |

To know this problem clearly, table 1 is given as an example problem. It consists of five movies (P, Q, R, S, and T) and four users (A, B, C, and D). User A gives a rating for movies P, Q, S, and T with 5, 5, 1 and 1. User A likes movie P and Q very much with giving the highest score, 5. Contrarily, He/she doesn’t like movies S and T with the lowest score 1. As a short, it shows that the more user like, the score will be more with 5 as the highest score. User A does not have a rating for movie R. It means user A has not watched this movie yet. With the same logic, Table 1 also shows the rating for the other users B, C and D for movies P, Q, R, S and T. The system is built to recommend for a user which movie should be watched by using the history data. It can be said the system will offer to each user which movies should be watched by sorting from the highest movie rating [6]. Figure 1 shows the process to build this recommendation system.

![Figure 1. Recommendation system algorithm.](image_url)
3.2. Mean normalization
For new users who are registered will not have preferences related to the film because it has not been recorded, because of the supported activities. So, it is quite difficult to use the required film. This is the initial part of the debate which is known as a cold start problem. To overcome this, it is calculated from the average value of each film calculated from the film rating. So that the film rating will be normalized with films that have an average of zero. This will increase efficiency much better.

3.3. Similarity matrices
Interactions on users and movies are expressed in a matrix ranking that can be transformed. Where the node corresponds to users and items, and an edge that connects users and items. So that structural steps can be used in the bipartite graph to identify the environment and then determine the nearest neighbor of the target user. SimRank is a well-known tool and proven effective in reducing sparsity problems. In this paper, we include SimRank for calculating the similarity of users in the collaborative filtering model.

3.4. Recommend top movies
The results of minimizing the X matrix and user ratings by using the parameter θ and films with the X feature will get the formula θ TX. The approach is to calculate the difference in features between films. So for small differences, it will be recommended for users. For example, small differences |Xi - Xj| between films i and j mean they are similar. In this study, Top Anime will be recommended based on the friendliness of the anime from the largest to the biggest difference.

4. Result and analysis

4.1. Dataset
The film dataset used in our experiment was obtained from the anime recommendation database “Kaggle”. Data provide two files namely anime data and rating on anime. This data consists of a relation between 73,516 users and 12,294 anime. Each user is able to add anime to their completed list and give it a rating and this data set is a compilation of those ratings.

```
In [5]: anime_data$episodes <- as.numeric(anime_data$episodes)
summary(anime_data)

anime_id   name             genre
Min. :1  Saru Keni Gassen : 4 Hentai : 823
1st Qu.:1  Shi no Nigii Long X200nas : 2 Comedy : 522
Median :10356  Summer : 1 Music : 780
Mean :14065  Summer Specials : 1 Kids : 199
3rd Qu.:34794 .Hack/.G.U. Returner : 1 Comedy, Slice of Life : 178
Max. :129527 .Hack/.G.U. Trilogy : 1 Dementia : 127

other : 13288 (Other) : 10332

Type   episodes   rating  members
movie : 14  12876  Min. :1.676  Min. : 6
music : 14812  10876  1st Qu.: 6.880  1st Qu.: 225
ova : 16999  572  Median : 6.576  Median : 1850
ova : 13211  26  514  Mean : 5.474  Mean : 16071
ova : 13211  26  514  3rd Qu.: 7.106  3rd Qu.: 9437
specials:676  3  595  Max. :10.000  Max. :10013917
TV : 3787  (other):3104  NA’s : 226
```

Figure 2. Summary of anime data.
4.2. Model evaluation

The collaborative filtering method is a method that guests the rating of the user’s data based on the similarity history of the other user preference. Collaborative filtering is implemented by using matrix factorization [7]. Figure 5, Figure 6, Figure 7, and Figure 8 are the process to show the rating recommendations. The recommendation system is built by Alternating Least Squares (ALS) on the training data as shown in Figure 9.

Figure 3. Distribution of types of shows.

Figure 4. Histogram of the ratings.
Figure 5. Top animes recommended.

In [29]: `top_animes('Slam Dunk')`

Similar shows to Slam Dunk include:

No. 1: Hajime no Ippo: New Challenger
No. 2: Beet the Vandel Buster Excillon
No. 3: Major S5
No. 4: Major S1
No. 5: Whistle!
No. 6: Gintama#:039;: Enchousen
No. 7: Aoki Densetsu Shoot!
No. 8: Major S4
No. 9: Major S2
No. 10: Major S6

Figure 6. Calculate the similarity value.

In [30]: `top_users(3)`

Most Similar Users:

User #934, Similarity value: 0.41
User #295, Similarity value: 0.27
User #335, Similarity value: 0.26
User #552, Similarity value: 0.22
User #969, Similarity value: 0.22
User #534, Similarity value: 0.21
User #777, Similarity value: 0.20
User #442, Similarity value: 0.19
User #312, Similarity value: 0.18
User #504, Similarity value: 0.17

Figure 7. Recommendation similar user.

In [31]: `similar_user_recs(3)`

Out[31]: [('Death Note', 6),
('Fullmetal Alchemist: Brotherhood', 6),
('Shingeki no Kyojin', 5),
('Clannad', 2),
('Clannad: After Story', 2)]

Figure 8. Prediction rating for anime.

In [32]: `predicted_rating('Slam Dunk', 3)`

Out[32]: 8.246414581525795
Figure 9. Build the recommendation model using ALS.

5. Conclusion
A better anime recommendation system based only on user watch history. A simple recommendation system can measure the similarity between performances, users and help predict whether users will enjoy certain anime. However, due to limitations calculating very large data sets, 100k data sets selected. Using a much more powerful machine, if a 1 million data set could be experimenting with. This paper shows a very simple but efficient recommendation system.

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