Case Study

Classification and Analysis of Recommender Systems

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Abstract: Recently recommender systems are developed for a wide variety of applications. This article focuses on the applications, real-world examples, types, and analysis of various recommender systems.

1. Introduction

The recommender is a choice or a suggestion system that recommends or acts as an information filter system to search to predict the "preference" or "rating" a user gives to the product or item [1,2]. This article focuses on the applications, real-world examples, types, and analysis of the different recommenders systems.

2. Applications of Recommendation Systems

The applications of recommendation systems are sketched in Figure 1. The applications include movies, advertising messages, music tracks, books, restaurants, news articles, courses in e-learning, future friends (social network sites), jobs, research articles, TV programs, investment choices, citations, online mates (dating services), clothes and supermarket goods, etc [3-5].

3. Real-World Examples

Some of the real-world examples of the pioneers in developing algorithms for recommender systems and applying these to the learners or users to get better filtration information include [6]:
a) GroupLens: This is used to develop the choice system with the collaborative filtering (CF) model. This includes many instances such as BookLens and MovieLens.
b) Amazon: The commercial recommendation system with advanced strategies.
c) Netflix Prize: This applies matrix factorization and latent factor models.
d) Google Youtube: This applies deep learning (DL) and hybrid strategies in social and online networks.

4. Various Types of Recommendation Systems

The different types of recommendation systems are sketched in Figure 2 [7-16]. These include popularity based recommendation systems, classification model based, content based recommendations, nearest neighbor CF, hybrid approaches, association rule mining, DL based recommendation systems.
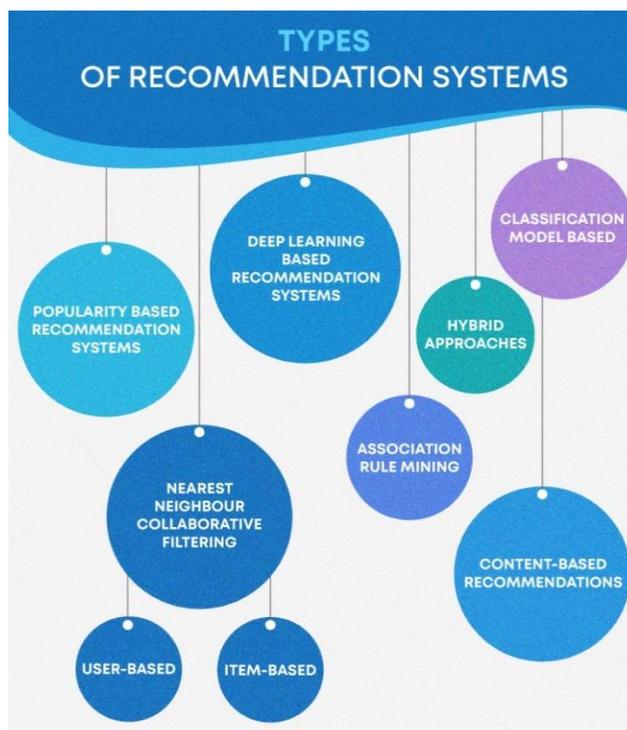
Figure 1. Applications of Recommender Systems

Figure 2. Types of Recommendation Systems

4.1. Popularity based Recommenders

These recommenders are applied to identify the missing information on websites for movie datasets. The recommenders should maintain the popularity ratings and reviews to recommend better content. Some of the information like browsing history and the preferences of users are not required but the star rating gives the scalability of the recommendation.

4.2. Demerits of the Popularity based Recommenders

These recommenders are not personalized and there will be discrepancies in the expected start rating.

### 4.3. Classification based Recommenders

The classification based recommendation model is sketched in Figure 3. The binary valued classifier is applied in recommending the items or products based on the user features such as gender, and age.
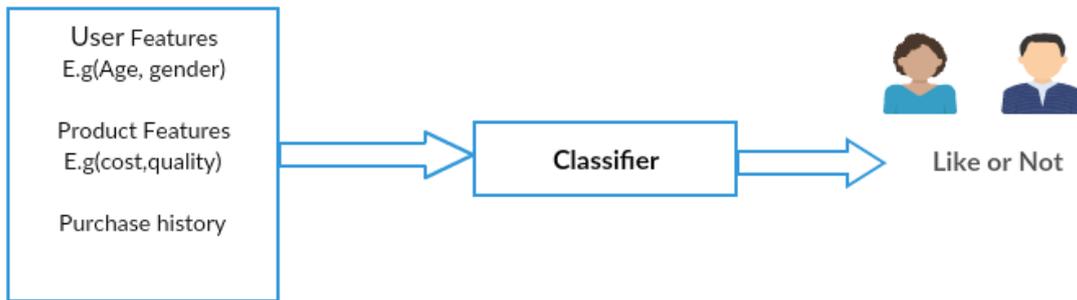
Figure 3. Classification based recommender

4.4. CF

CF approaches are based on assumption that how people like items compared to several characteristics. CF is modeled using nearest neighbor and matrix factorization approaches. The nearest neighbor model is used to search out either like users or like items. This model is implemented using user-based and item-based filtration systems, as shown in Figure 4. The user-based CF searches the users who have similar tastes in items as the current user. The similarity is computed using learner and neighbor behaviors. The item-based CF models and suggests products that are similar to the product's user has taken and the similarity is computed using the purchase co-occurrences.
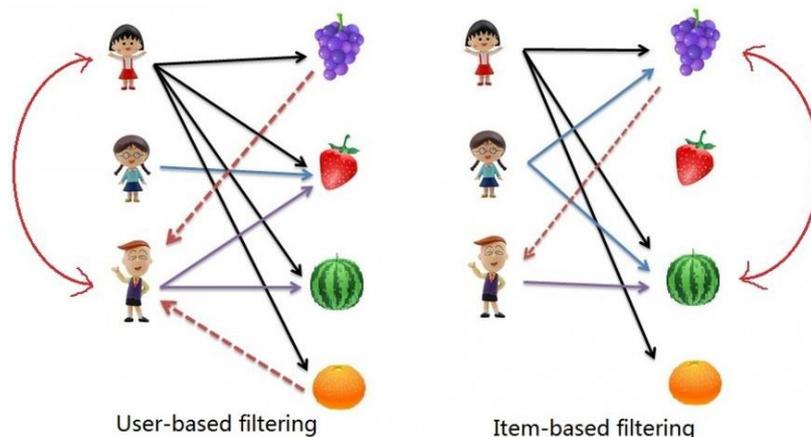
Figure 4. Nearest neighbor CF

4.5. Matrix Factorization

This is based on the CF model, when the learner submits movie feedback it is represented in the matrix form with rows (users) and columns (movies).

Figure 5. Matrix factorization

4.6. Hybrid Recommenders

Hybrid recommenders are modeled by combining CF and content-based recommenders to achieve effective performance for different real-world applications.

5. Conclusions

Recommender systems are recently designed to solve many applications. This article gives an overview of the applications, real-world examples, types, and analysis of various recommender systems.

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