**Collaborative Filtering**

It is a technique used to generate product/service recommendation to a user based on the preferences of other users with similar attitude. So, lets assume that you have decided to buy a car, then this method analyses your behavior and matches it with other users with similar interest, then recommend a car that those users like since you have same interest as others.

It analyses your behavior, then it matches it with other users with same interest, then recommend you a product that others liked due to similar taste. If you want to buy a car then the system will recommend a car based on other people who has the same taste as you and bought that car in the past. So, if you have a similar taste as your cousin then chances are that you buy another product that your cousin bought in the past, so if your cousin liked the product, then you will like it as well because you share same interest or are like minded.

The system uses statistical methods to search for a set of users who have similar transactions history to the active user. (2)

From Textbook:

Collaborative Filtering is a technique used to make automatic predictions about the preference of a user derived by analyzing the preferences of other users that have similar interests. The underlined characteristic of this type of filtering is that if a person A has the same preference as person B, therefore, person A will be more likely to like another service/product that person B likes comparing to a random customer.

It can further split into six main categories

* model-based,
* memory-based,
* clustering based,
* matrix and tensor factorization,
* deep learning, and
* hybrid method.

**Memory-Based Collaborative Filtering**

This Model uses statistical relationship such as correlation related to user’s rating to make recommendations. This approach uses the entire dataset to successfully recommend items.

Two types:

* User Based
* Item Based

**User Based:**

It is a recommendation technique that recommends item to a certain buyer based on the ratings of that item by other people with similar interest as the buyer. So, pretty much finds users that have similar taste as you and make a recommendation based on the highest rated item voted by those users.

**Item Based:**

A rating is assigned to an item that you wish to buy based on your ratings of similar products that you have already rated.

**Model Based Collaborative Filtering**

Comparing to the memory-based approach, the model-based one usually does not use

the entire dataset to compute the predictions, but it uses a training set for predicting the future ratings. For recommending an item, a model first analyzes the user-item matrix. Next, it identifies the relationship among the items, and then it compares these relations with top-N recommendations list. After a model is constructed, predictions could be computed very fast. (1) (direct citation)

Making recommendations with this approach involves a part of the entire dataset. So, a subset of the entire dataset is taken to build a model, which is used to generate recommendations.

**Clustering Based Collaborative Filtering**

This method implies the usage of various clustering techniques to cluster the users and the items based on similar preferences and similar attributes correspondingly by using distance-based methods [23]. Neighborhood methods are centered on computing the relationships between users or, alternatively, between items. The user-based approach evaluates the user’s neighborhood to determine what items users with the same interest in that neighborhood might be interested in. An example of a clustering-based collaborative filtering in the healthcare domain is the application in the Clinical Decision Support System (CDSS) that helps with personalizing the diagnosis and treatment decisions [18]. The neighborhood-based. Collaborative Filtering methods are used to exploit high-dimensional clinical data. The system is utilizing an exclusively data-driven approach, extended by a set of 4 M. Ivanova and Z. W. Ra´s evidence-based contraindication rules. Patients having similar therapy characteristics and history can be analyzed to make a prediction for the therapy outcome. Trust plays a key role to leverage the acceptance and applicability of such systems. This Recommender System leverages the data-driven approach to increase trust and reduce the risk of the proposed system. (1) (direct citation)

Matrix and Tensor Factorization-Based Collaborative Filtering

Some of the most successful implementations of latent factor models are based on matrix factorization [25, 30]. Recommender systems mainly base their suggestions on rating data of two entities (users and items), which are placed in a matrix with one representing the users and the other representing items of interest. Generally, matrix factorization characterizes both items and users by vectors of factors inferred from item rating patterns [26]. The overall interest of the item characteristics of a specific user is derived by computing the dot product of the given user interests based on corresponding factors related to the items and the actual item characteristics [37]. High correspondence between item and user factors leads to a better recommendation.

References:

1. (Zbigniew W. Ras (editor), Alicja Wieczorkowska (editor), Shusaku Tsumoto (editor), Recommender Systems for medicine and Music 2021)
2. Comparative-analysis-memory-based-model-based-recommendation-systems