

# Chapter 9

## Recommendation System

### ABSTRACT

*Recommendation systems are critical tools used by marketing departments to provide customers with product recommendations. Data scientists also use recommendation system analysis to assess the effectiveness of product and service suggestions. There are two types of recommendation systems: content-based and collaborative filtering. Content-based recommendations are based on the customer's purchase history, while collaborative filtering suggests a product based on purchasing behavior. Collaborative filtering can be divided into content-based filtering, which suggests products based on similar purchasing behavior, and item-based filtering, which suggests products based on their attributes. User-based and item-based nearest-neighbor collaborative filtering and probabilistic methods are used to analyze data and provide product suggestions. Businesses rely on recommendation systems to achieve various objectives such as customer retention and increased ROI. RapidMiner can analyze data following the principles of the recommendation system, as demonstrated in this chapter, step-by-step.*

### INTRODUCTION

Many organizations have a set of data that can be used to support decision-making on matters such as marketing data. Such data are therefore used for the creation of an advisory system. For example, when a customer logs into an online bookstore, the recommendation system will offer books that are similar to the ones the customers have previously ordered. This is to increase the chances of a customer purchase. Recommendation System can increase a lot of sales for online stores. It is widely used in many industries such as tourism and hotels where the system advises on accommodation and attractions in line with the tastes of the customers (Aditya et al, 2021: Chen & Qin, 2021: Wayan Priscila Yuni Praditya, Erna Permanasari, Hidayah, 2021).

## RECOMMENDATION SYSTEM

The recommendation system is divided into two types.

1. **Content-Based Recommendation:** It focuses on making recommendations using past content as a reference (Tai, Sun & Yao 2021). For example, when a customer has previously purchased Product A, the system will present Product A and other products that are similar in properties to Product A.
2. **Collaborative Filtering:** CF focuses on analyzing customer behavior (Emon et al, 2021: Khatter et al, 2021). For example, Customer A tends to buy soap and shampoo all together, so Customer B who buys soap will likely buy shampoo too. The aforementioned system is also divided into 2 forms.
  - a. **Content-Based Filtering:** This is to focus on analyzing user behavior such as a group of customers with similar purchasing behavior (Yadalam et al., 2020: Kamukwamba & Chunxiao, 2021).
  - b. **Item-Based Filtering:** This is to focus on analyzing product properties (Kusumawardhani, Nasrun & Setianingsih, 2019: Lourenco & Varde 2020: Padhy, Singh & Vetrivelan, 2022). For example, scooter and skateboards are different products but share similar properties.

The CF processing algorithm is a prediction of the similar data from the existing data, as in the example.

Table 1. Examples of datasets for forecasting data with recommendation system

	Data Mining Techniques	Python	Design Thinking	Technology Management
Sarawut Ramjan	5	2	5	4
Jirapon Sunkpho	2	5	?	3
Kom Campiranon	2	2	4	2
Purimprach Saengkaew	5	1	5	?

Sample dataset presents the student’s satisfaction on each subject. 1 means most disliked while 5 means most liked. In CF processing algorithms, data scientists put datasets into processing to predict empty values. For example, Jirapon Sunkpho has not filled out his satisfaction in the Design Thinking course, so CF processing will use existing data to predict what extent Jirapon Sunkpho is likely to favor the course. If the forecast result is at level 5, it means most favorable. The recommendation system will recommend Design Thinking course to Jirapon Sunkpho.

Data mining techniques applied to the development of the recommendation system can be divided into 2 types: 1. Non-Probabilistic Algorithms such as K-Nearest Neighbors (KNN); both User-Based and Item-Base, and 2. Probabilistic Algorithms such as Bayesian-Network Modes.

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