: What is a recommender system?

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A recommender system is a software tool that provides suggestions to a person for a defined domain or task. The recommendations may be personalized or more general. Such systems have also been called suggestion models (Alter, 1980) or recommendation systems. Recommender systems implemented using Artificial Intelligence (AI) technologies are a subcategory of Knowledge-driven DSS (Power, 2007). Also, a recommender system may be considered a specialized type of Information Retrieval (IR) system. Recommender systems may be implemented using a machine learning technology like a neural network. Finally, some recommender systems are a type of information filtering system that seek to predict the 'rating' or 'preference' that a specific user would give to an item or object.

Making recommendations is the purpose of recommender DSS. The technology and architecture of a specific recommender system determines the dominant component and hence the category of DSS. For example, rule-based AI recommender systems are knowledge-driven, while machine learning based systems are data-driven.

Many years ago, Alter (1980) reported on a suggestion model DSS that performed complex calculations to adjust rates on group insurance policies and make a recommendation to an underwriter. In 1992, the first commercial collaborative filtering system called "Tapestry" was discussed in the literature, cf., Goldberg, Nichols, Oki, and Terry (1992). Tapestry was designed to recommend documents drawn from newsgroups to a collection of users. The motivation for the system was to use social collaboration to reduce the volume of streaming documents.

Recommender systems have helped overcome the challenges related to information overload and seem especially valuable tools for inexperienced users involved in information intensive decision-making processes and situations.

Recommendation systems can aid decision makers. Melville and Sindhwani assert "Obtaining recommendations from trusted sources is a critical component of the natural process of human decision making."

In a new specialized online course, Konstan and Ekstrand (2015) note "Recommender systems have changed the way people find products, information, and even other people." The course focuses on algorithms for content-based filtering, user-user collaborative filtering, item-item

collaborative filtering, dimensionality reduction, and interactive critique-based recommenders."

There are many web applications that provide recommendations. Two common applications are recommending news articles and providing suggestions to an online customer about what to buy, based on their past history of purchases and/or product searches. For example, Netflix recommends movies to its customers. Also, a search engine is a simple type of recommender system. A recommender system based upon user preferences can be simple with a user answering yes/no questions or data intensive based on past behaviors of the person or people similar to the person receiving recommendations.

There are two broad types of recommendation systems. Leskovec, Rajaraman and Ullman (2014) note "One class of recommendation system is content-based; it measures similarity by looking for common features of
the items. A second class of recommendation system uses collaborative filtering;
these measure similarity of users by their item preferences and/or
measure similarity of items by the users who like them (p. 339)." Stated in another way, recommendations can be based upon features of past items purchased, read or watched to determine their similarity to new items. This approach requires some type of user behavior data. Another approach is to base a recommendation upon other users that are most similar to the target user and then recommend items that these similar users have purchased, read or watched that the targeted user has not. Recommendations are based upon assumptions about what a person prefers and wants.

Recommender systems are analytics-based information systems. Based upon data about user preferences the algorithm provides recommendations for books, movies, or other products or activities. Two common methods used are matrix factorization and collaborative filtering. Matrix factorization characterizes both items and users by "vectors of factors" derived from item rating patterns.

People like advice and decision makers can benefit from "good" advice. There are many opportunities to create recommender systems in specialized domains. If you want to learn more, I recommend you read Leskovec, Rajaraman and Ullman Chapter 9 (2014) and watch the massive open online course (MOOC) taught by Konstan and Ekstrand "Introduction to Recommender Systems".

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Please cite as:

: What is a recommender system?

Power, D. J."What is a recommender system?" Decision Support News, Vol. 16, No. 07, April 12, 2015; updated April 2, 2017.

Author: Daniel Power
Last update: 2017-04-27 09:12