

Chapter 34

Using a Fuzzy-Based Cluster Algorithm for Recommending Candidates in E-Elections

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ABSTRACT

The use of the Internet now has a specific purpose: to find information. Unfortunately, the amount of data available on the Internet is growing exponentially, creating what can be considered a nearly infinite and ever-evolving network with no discernable structure. This rapid growth has raised the question of how to find the most relevant information. Many different techniques have been introduced to address the information overload, including search engines, Semantic Web, and recommender systems, among others. Recommender systems are computer-based techniques that are used to reduce information overload and recommend products likely to interest a user when given some information about the user's profile. This technique is mainly used in e-Commerce to suggest items that fit a customer's purchasing tendencies. The use of recommender systems for e-Government is a research topic that is intended to improve the interaction among public administrations, citizens, and the private sector through reducing information overload on e-Government services. More specifically, e-Democracy aims to increase citizens' participation in democratic processes through the use of information and communication technologies. In this chapter, an architecture of a recommender system that uses fuzzy clustering methods for e-Elections is introduced. In addition, a comparison with the smartvote system, a Web-based Voting Assistance Application (VAA) used to aid voters in finding the party or candidate that is most in line with their preferences, is presented.

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1 MOTIVATION

The rapid increase of information on the Internet is currently a key issue when one is looking for relevant information. In the political sector, the amount of available information about candidates and political parties is also drastically increasing. This is becoming a significant issue for voters when they face election processes that require them to select their representatives from a big list of candidates since, in many cases, the candidates are relatively unknown to their constituents.

In this chapter, the use of recommender systems for eElections is presented as an alternative to solve the problems of information overload.

Recommender systems are computer-based techniques that attempt to present information about products that are likely to be of interest to a user. This technique is mainly used in eCommerce in order to provide suggestions on items that a customer is, assumable, going to like.

Yager (2003) distinguishes between recommender systems and targeted marketing by considering that a recommender system is a “participatory” system in which the user intentionally provides information about his preferences. In a targeted marketing effort, the recommendation is based on extensional information, which is nothing but information predicated upon the actions or past experiences with respect to specific objects.

A recommender system for eCommerce specifies two basic entities, which include the user (i.e., customer) and the item (i.e., product). The main goal of this type of recommender system that is used in eCommerce is to basically increase the sales of products. The main problems of recommender systems, according to Vozalis et al. (2003), include the following:

- **Quality of Recommendations:** The information received from a recommender system must be reliable; for that reason, recommender systems should minimize the

number of false positive results (i.e., the products that the customer does not like).

- **Sparsity:** A recommendation system is related to the number of recommendations made by customers. The sparsity problem of recommender systems emerges when the number of rated items is small compared to the total number of items, which leads to weak recommendations since the recommender systems are based on similarities between individuals.
- **Scalability:** Increasing the number of users and products elevates the cost in terms of computations in recommender systems.
- **Lost of Neighbor Transitivity:** The correlations between users cannot be expressed unless they have purchased and rated common items.
- **Synonymy:** Recommender systems generally cannot link products with different names that belong to the same category.
- **First Rater Problem:** A product cannot be recommended unless another customer has previously rated it.
- **Unusual User Problem:** This problem refers to users who cannot define their opinion about a product. This causes inconsistent recommendations.

The most-used techniques in recommender systems are based on collaborative filtering technologies according to Guo et al. (2007) and Sarwar et al. (2001). They include collaborative filtering algorithms that are memory-based (i.e., user-based) and model-based (i.e., item-based).

- **Memory-based collaborative filtering algorithms:** These techniques are based on the computation of “neighborhood formation” that uses the user-item matrix R , which contains the ratings of items by users (users are not required to provide their opinion on all items). This may cause the previously mentioned problem of sparsity.

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