Chapter 98
Systematic Literature Review on Empirical Results and Practical Implementations of Healthcare Recommender Systems:
Lessons Learned and a Novel Proposal

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ABSTRACT

This systematic literature review is aimed at examining empirical results and practical implementations of healthcare recommender systems. While fundamentally many of the development of recommender systems in medical and healthcare are based on theory and logic, the performance is always measured in terms of empirical results and practical implementations from evaluation of such systems. Besides, the ultimate judgment of the effectiveness of the methods and algorithms used is often based on the empirical results of recommender systems. Robustness, efficiency, speed, and accuracy are also best determined by empirical results. Extensive search was carried out in some major databases. Literature were grouped into three categories namely core, related, and relevant. The core papers were subjected to further analysis. The result shows that most work reviewed were partially evaluated and have a promising future. Moreover, a yet-to-be explored novel proposal for integration of a recommender system into smart home care is presented.

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INTRODUCTION

Traditionally a recommender system uses the input data to predict potential preferences and interests of its users. Past evaluations of the user can be part of the input data (Lu *et.al*., 2012). A Recommender System collects information on the preferences of its users for a set of items using different sources of information for providing users with predictions and recommendations of items (Bobadilla *et.al.*, 2013). A recommender system has become an important tool in commerce and other sectors (such as health) of our social and economic life. It has brought many changes and also created new possibilities for the business of the companies. The typical implementation of recommender system known to many people is the search engine such as Google. The main characteristics of a recommender system is that it can personalize the interactions for each individual user. Personalization involves the design of systems that are able to infer the needs of each person and then to satisfy those needs (Riecken, 2000). Recommender systems have been developed to meet the needs of users in different domains by using different methods and algorithms (Herlocker *et. al*., 1999). However, identifying the best possible algorithm for each domain or use case has been a challenge, since there is no general agreement among researchers neither on the required attributes nor the metrics for these attributes (Herlocker *et. al*., 2004).

In recent years, the world has experienced tremendous growth in the amount of information available on the Internet with accompanied growth in the number of people searching for such information that would be useful and helpful to them. This has posed challenges, such as how to produce high-quality recommendations and how to perform as many recommendations as possible per second for millions of users and items simultaneously (Sarwar *et. al*., 2001), for the developers of recommender systems. One very important aspect is also the relevance of recommendations, since it cannot be considered as the absolute truth but more like a user-defined issue (Moreau *et. al*., 2002) and thus it is always subject to change when user's interests, activities, and preferences change.

Using different sources of information, recommender systems provide users with predictions and recommendations of items (Bobadilla *et. al.,* 2013). Most often these recommendations are based on user's own preferences and others who have similar preferences. More recently, attention has been shifted to recommendation systems with learning capabilities. Based on user's activities, recommender system can come up with predictions that will match user's interests and predict what might also appeal to the user. Recommender systems are nowadays more than just systems for matching and predicting user preferences: Indeed, the definition of a recommender system nowadays includes any system that produces individualized recommendations as output or can guide the users in a personalized and useful way towards meeting their aims (Burke, 2002). This is essential in a situation where an individual is bombarded with an array of information far beyond her capacity to survey and get the desired information in a given time with available resources. When comparing recommender systems with the search engines and other information retrieval systems, some researchers have cited the terms *individualized*, *interesting,* and *useful* as the differentiating criteria (Burke, 2002; Olmo & Gaudioso, 2008). This should be the main objective of recommender systems to be pursued bearing in mind the robustness, effectiveness, speed, and accuracy.

When searching for the optimal performance of recommender systems, different models have been identified, such as the user model, the item model, and the data model. Most researchers feel that the data model based approach is the best way of bringing new improvements in the field of recommender systems (Adomavicius *et. al*., 2005).