Chapter 14
Recommender Systems in Healthcare: Towards Practical implementation of Real–Time Recommendations to Meet the Needs of Modern Caregiving

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ABSTRACT

In this chapter the appropriateness of any recommender system in healthcare, which lies in its ability to provide capabilities for meeting the challenges of modern care giving, is examined. The impacts of over two decades of research in and implementation of recommender systems in healthcare are extensively examined in two consecutive periods: first to examine empirical results and practical implementations while the second focuses on validating the earlier findings and justifying the propositions made. Although the result indicates an optimistic progress and upward trend in both the research and implementation, there are compelling reasons to invest more efforts at harmonizing evaluation criteria and metrics. In addition, in order to appropriately, adequately, and effectively meet the challenges of modern care, the rapidly evolving trends, and changing technologies, a novel solution with potential for these capabilities is proposed: a solution to provide real-time recommendations and make them available for sharing among stakeholders in real time.

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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 (Babadilla et al., 2013). This has made a recommender system 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 the personalization of interactions for an individual user. Personalization involves designing systems that are able to infer the needs of each person and then 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 either on the required attributes or 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 for the developers of recommender systems, especially on how to produce high-quality recommendations and perform as many recommendations as possible per second for millions of users and items simultaneously (Sarwar et al., 2001). Besides speed another important aspect of this challenge is 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. Predictions and recommendations made emanate from different sources of information (Babadilla 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 recommender 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 system, nowadays, is not just a tool for matching and predicting user preferences, it involves producing individualized recommendations as output. It can also act as a tool that 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 his/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, distinguishing criteria have been individualized, interesting, and useful. (Burke, 2002; Olmo&Gaudiooso, 2008). This should be the main objective of recommender systems to be pursued besides robustness, effectiveness, speed, and accuracy. However, a recommender system for healthcare that will automatically take into cognizance the progressions of some ailments and provide recommendations based on this is a future too late to go. This kind of recommendation, combined with real-time capability, will tremendously improve caregiving for the ailing, their care providers and caregivers. 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).
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