Chapter 6
Intelligent Techniques in Recommender Systems and Contextual Advertising: Novel Approaches and Case Studies

Giuliano Armano
University of Cagliari, Italy

Alessandro Giuliani
University of Cagliari, Italy

Eloisa Vargiu
University of Cagliari, Italy & Barcelona Digital Technology Center, Spain

ABSTRACT

Information Filtering deals with the problem of selecting relevant information for a given user, according to her/his preferences and interests. In this chapter, the authors consider two ways of performing information filtering: recommendation and contextual advertising. In particular, they study and analyze them according to a unified view. In fact, the task of suggesting an advertisement to a Web page can be viewed as the task of recommending an item (the advertisement) to a user (the Web page), and vice versa. Starting from this insight, the authors propose a content-based recommender system based on a generic solution for contextual advertising and a hybrid contextual advertising system based on a generic hybrid recommender system. Relevant case studies have been considered (i.e., a photo recommender and a Web advertiser) with the goal of highlighting how the proposed approach works in practice. In both cases, results confirm the effectiveness of the proposed solutions.
INTRODUCTION

Information Filtering (IF) is aimed at presenting only relevant information to users. IF systems cover a broad range of domains, technologies, and methods involved in the task of providing users with the information they require (Hanani, et al., 2001). IF systems are, typically, able to handle large amounts of data with the following characteristics:

1. Primarily textual,
2. Unstructured or semi-structured, and
3. Based on user profiles. IF systems are also expected to remove irrelevant data from incoming streams of data items.

The current generation of IF systems requires improvements to make filtering methods more robust, intelligent, effective, and applicable to an even broader range of real life applications. In particular, focusing on a collaborative scenario like the Web 2.0, users need suggestions about online items (e.g., Web pages, news, photos, ads), according to their preferences and tastes. To this end, research activities in this field might be focused on defining and implementing intelligent techniques that rely, for instance, on machine learning, text categorization, evolutionary computation, and Semantic Web (Armano, et al., 2010).

IF is typically performed by Recommender Systems (RS). In particular, RS have been widely advocated as a way of coping with the problem of information overload in many application domains and, to date, many recommendation methods have been developed (Wei, et al., 2000).

Besides recommendation, an emergent field in IF is Contextual Advertising (CA). CA systems are devoted to suggest suitable advertisements (ads) to users while surfing the Web. Most ads on the Web are short textual messages usually marked as “sponsored links” (Deepayan, et al., 2008).

In the literature, RS and CA have been separately studied, despite the existence of common issues. In fact, the task of suggesting an ad to a Web page can be viewed as the task of recommending an item (the ad) to a user (the Web page), and vice versa. In our opinion, a unifying view could be useful to study and experiment novel strategies to exploit benefits and experiences from both research fields (Armano & Vargiu, 2010). In this chapter, after a brief survey of relevant related work on both RS and CA, we test the reliability of the proposed unifying view by proposing a content-based RS devised a la mode of CA (Ad-dis, et al., 2010a), and a novel hybrid CA system devised a la mode of RS. In the following, to show the effectiveness of both approaches, we present a relevant case study for each of them: a photo recommender and a Web advertiser, respectively. A discussion on further relevant unified solutions ends the chapter.

BACKGROUND

In this section, we first give a summary about IF—recalling the main contributions in this field. Subsequently, we concentrate on two specific subfields of IF: RS and CA (the former filters items according to users’ interests and preferences, whereas the latter filters ads according to the content of the given Web page).

Information Filtering

Two major approaches characterize IF systems: knowledge based and user model based. IF systems that follow the former approach use artificial intelligence techniques to represent user profiles and to implement filtering and learning capabilities. In particular, these systems use production-rules (Malone, et al., 1987; Wolinski, et al., 2000), semantic-nets (Stefani & Strapparava, 1999; Asnicar & Tasso, 1999), and artificial neural networks (Jennings & Higuchi, 1992; Kantor, et al., 2000). The adopted user model in IF systems differs from each other mainly in the following aspects (Belkin & Croft, 1992): data acquisition, content model, and underlying architecture. As for