

# User Models for Adaptive Information Retrieval on the Web: Towards an Interoperable and Semantic Model

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## ABSTRACT

*Searching information can be realized thanks to specific tools called Information Retrieval Systems IRS (also called “search engines”). To provide more accurate results to users, most of such systems offer personalization features. To do this, each system models a user in order to adapt search results that will be displayed. In a multi-application context (e.g., when using several search engines for a unique query), personalization techniques can be considered as limited because the user model (also called profile) is incomplete since it does not exploit actions/queries coming from other search engines. So, sharing user models between several search engines is a challenge in order to provide more efficient personalization techniques. A semantic architecture for user profile interoperability is proposed to reach this goal. This architecture is also important because it can be used in many other contexts to share various resources models, for instance a document model, between applications. It is also ensuring the possibility for every system to keep its own representation of each resource while providing a solution to easily share it.*

*Keywords: Adaptive Information Retrieval, Interoperability, Personal Information Sharing, Profiling, User Model*

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## INTRODUCTION

Retrieving information on the Web is not an easy task especially for novice users. Indeed, using a search engine (e.g., Google, or Yahoo!)

implies some knowledge related to the search engine itself and related to the concerned topics. To help users to retrieve more accurate information, search engines (or Information Retrieval Systems - IRS) provide users with adaptive features. That is to say the result obtained by end-users becomes more and more

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personalized. To do this, each search engine models a user thanks to his previous queries, his interactions with the search engine... in order to achieve an accurate and personalized retrieval. Such idyllic vision is quite limited when considering that users can use several search engines for a same query or choose the most suitable search engine for a specific topic. In this context, what is the impact of such a behavior on personalization features? We can notice that user modeling is always specific to each search engine and limited to only one search engine at a time whereas a user does not really change when using another search engine for the same information need. Moreover, from the user point of view, he has to give the same information (name, topics of interest...) to every search engine in order to get personalized features. Some recent work about unique identification like *openID* (<http://openid.net/>) can limit this issue. What about user models? How this information could be shared between several search engines in order to build a more complete and precise user model? Indeed, the more the user model is precise, the more the personalization process is effective. This paper tackles this issue and describes a flexible and interoperable user model architecture which is adapted for information retrieval systems and that enables sharing of personal information between many systems.

This paper is organized as follows: the traditional ways to build user models in information retrieval context are described in the first section. Then, a general discussion about the completeness of user models in today's applications is provided. Section titled "A Semantic Architecture For User Profile Interoperability" illustrates the proposed semantic architecture to ensure user profile interoperability considering conclusions coming from the previous discussion.

## USER MODELING IN THE DOMAIN OF INFORMATION RETRIEVAL

The role of the user is very important at different steps of the information retrieval process (querying, analyzing search results ...). Moreover, as users' satisfaction is the main goal of information retrieval systems, describing the users precisely is a key step to reach this goal. So, a user *model* (also called *profile*) is required to achieve an adaptive information retrieval (AIR) process. Such a model allows the system to better know the user, his information needs and his behavior (Finin, 1989). In a general point of view, it can be composed of data and rules. In the specific Information Retrieval field, a user model is rather commonly described by a set of eventually weighted characteristics that describe the user himself (Korfham, 1997).

In this paper user modeling is studied under two main aspects: *model definition* and *model content*. It does not concern the way the user models are exploited and the way they evolve along time. Note that the discussion about user models is the same for either individual user modeling or user group modeling.

### User Model Definition

User modeling implies the identification or the elicitation of features (data, rules ...) that characterize each user in a specific context or for the realization of a particular task. Several techniques exist and two main approaches can be identified in the AIR field to define user models. Thus, *stereotypes* or *profiling* techniques can be applied to associate to a user a model that characterizes him.

- *Profiling* (Cho et al., 2002) consists in tracking the user during his different log sessions and in analyzing his behavior. Every user is associated to a personal model that characterizes him;
- *Stereotypes* (Shapira et al., 1997) consist in associating users to pre-defined classes. These classes contain specific character-

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