

## Preface

This book deals with the improvement of user modeling in the context of Collaborative and Social Information Retrieval and Access (CSIRA) techniques. Information retrieval and access techniques are aimed at helping users to find information relevant to their needs. Today, in order to improve their effectiveness, some specific techniques have to take into account external characteristics such as those related to the user (and his context) which are most of the time little or not known by the system. Nevertheless we can observe that the applications related to the Web 2.0 which integrate users' characteristics bring rather best results and at least personalized results.

It thus seems acquired that the collaborative and social aspects characterizing the users' social context can be used to improve the way the information access and retrieval systems "know" each user through user modeling approaches.

Consequently improving user modeling taking into account social and collaborative aspects for information retrieval and access is a vast domain in which several disciplines intervene (computer science, cognitive science, information science, etc.). This is a recent research trend that integrates recommender systems, social networks analysis (Wasserman et al., 1994), adaptive information retrieval, user modeling, and social information retrieval (Kirsh, 2003) techniques and so on.

The objective of this book is to draw up a panorama of the concepts, techniques, and applications linked to CSIRA. This book is aimed at readers of any disciplines (information science or information technology, cognitive science, computer science, etc.) and contributes to the diffusion of the concepts to any public (graduate and post-graduate students, information system designers, information retrieval system designers, scientists, etc.).

## ORGANIZATION

This book presents operational and innovative ideas to integrate user modeling in order to improve CSIRA effectiveness. This book includes twelve chapters gathered in three sections. Section I covers generalities related to user modeling in the context. Section II deals with advances in user modeling and Section III presents some applications of such improved user modeling.

As it can be seen in the following description of the chapters, the contributions cover a large scope of techniques to improve user modeling in such a context. The reference section in each chapter includes numerous reference sources to help interested readers to find comprehensive sources and additional information.

## Section I

### User Modeling in CSIRA

This section introduces one of the classical techniques of CSIRA and the way users are taken into account in these techniques. The two chapters are focused on recommender systems that are tools aiming at helping users to find items/information that they should consider as relevant from huge catalogues.

**Chapter I** describes the state of the art related to recommender systems. It deals with the three main types of filtering techniques and the way such techniques can be evaluated.

**Chapter II** is focused on Collaborative Filtering techniques underlying different issues and system vulnerabilities. This chapter also presents a discussion related to when such techniques should be used, how recommendations are generated / evaluated.

## Section II

### Advances in User Modeling in CSIRA

Through four chapters, this section is dedicated to the introduction of some advances in user modeling. Those advances are based on novel approaches taking into account communal tags, ontology-based semantic features, user intents and competencies.

**Chapter III** investigates methods for enabling improved navigation, user modeling and personalization using collaboratively generated tags. The authors discuss the advantages and limitations of tags, and describe how relationships between tags can be used to discover latent structures that can automatically organize a collection of tags owned by a community.

**Chapter IV** shows how a user profile can be built without any explicit input. Based on implicit behavior on social information networks, the profiles which are created are both adaptive (up to date) and socially connective. The proposed approach relies on the use of a Collaborative Tagging System like *Delicious*.

The authors of **Chapter V** study and present their results on the problem of employing a cognitive user model for Information Retrieval (IR) in which a user's intent is captured and used for improving his/her effectiveness in an information seeking task. The user intent is captured by analyzing the commonality of the retrieved relevant documents.

**Chapter VI** explores a Semantic Web-based modeling approach for document annotations and user competencies profile development. This approach is based on a same domain ontology set which constitutes the binder between materials and users. A variant of the nearest neighbor algorithm is applied to recommend concepts of interest and then document contents according to competencies profiles.

## Section III

### Improved User Modeling: Application of CSIRA

This section supplies six chapters describing applications for which a specific user modeling is used to improve information retrieval and access techniques in a collaborative and social context. Such improved techniques are aimed at recommending more adapted bibliographical references, Web pages or music for instance and at adapting the information content to mobile users.

**Chapter VII** explores the effectiveness of a sharing of knowledge policy on a collaborating group in order to satisfy a shared information need. The search engine exploits user relevance judgments to propose a new ranked list.

**Chapter VIII** suggests a social search engine that identifies documents but more specifically users relevant to a query. It relies on a transparent profile construction based upon user activity, community participation, and shared documents.

**Chapter IX** proposes a Peer-to-Peer bibliographical reference recommender system. It consists in finding relevant documents and interesting people related to the interests and preferences of a single person belonging to a like-minded.

Collaborative, content-based, and case-based recommendation systems and their hybrids have been used for music recommendation. **Chapter X** shows how specific user information can be used to improve user model for ameliorate music recommendation accuracy.

**Chapter XI** is dedicated to a novel machine learning (based on reinforcement learning) perspective toward the Web recommendation problem. A hybrid Web recommendation method is proposed by making use of the conceptual relationships among Web resources to derive a novel model of the problem, enriched with semantic knowledge about the usage behavior. The method is evaluated under different settings and it is shown how this method can improve the overall quality of recommendations.

**Chapter XII** presents a twofold approach for adapting content information delivered to a group of mobile users. It is based on a filtering process which considers both the user's current context and her/his preferences for this context.

## CONCLUSION

The variety of the approaches developed to improve CSIRA effectiveness, as the richness of the various work undertaken on this subject tend to show that user modeling is in the center of the current concerns. In this way this book constitutes a real survey of advances and applications in user modeling for CSIRA.

## Selected Readings

### A User-Centered Approach to the Retrieval of Information in an Adaptive Web Site

This chapter describes the user-centered design approach we adopted in the development and evaluation of an adaptive Web site. The development of usable Web sites, offering easy and efficient services to heterogeneous users, is a hot topic and a challenging issue for Adaptive Hypermedia and Human-Computer Interaction. User-centered design promises to facilitate this task by guiding system designers in making decisions, which take the user's needs in serious account.

Within a recent project funded by the Italian Public Administration, we developed a prototype information system supporting the on-line search of data about water resources. As the system was targeted to different types of users, including generic citizens and specialized technicians, we adopted a user-centered approach to identify their information needs and interaction requirements. Moreover, we applied query analysis techniques to identify further information needs and speed up the data retrieval activity. In this chapter we describe the requirements analysis, the system design and its evaluation.

## Personalized Information Retrieval in a Semantic-based Learning Environment

Active learning is the ability of learners to carry out learning activities in such a way that they will be able to effectively and efficiently construct knowledge from information sources. Personalized and customizable access on digital materials collected from the Web according to one's own personal requirements and interests is an example of active learning. Moreover, it is also necessary to provide techniques to locate suitable materials. In this paper, we introduce a personalized learning environment providing intelligent support to achieve the expectations of active learning. The system exploits collaborative and semantic approaches to extract concepts from documents and maintaining user and resources profiles based on domain ontologies. In such a way, the retrieval phase takes advantage from the common knowledge base used to extract useful knowledge and produces personalized views of the learning system.

## A Semantic Web based Approach for Context-Aware User Query Formulation and Information Retrieval

Formulating unambiguous queries in the Semantic Web applications is a challenging task for users. This article presents a new approach in guiding users to formulate clear requests based on their common nature of querying for information. The approach known as the front-end approach gives users an overview about the system data through a virtual data component which stores the extracted metadata of the data storage sources in the form of an ontology. This approach reduces the ambiguities in users' requests at very early stage; and allows the query process effectively performs to fulfill users' demands in a context-aware manner. Furthermore, the approach provides a powerful query engine, called context-aware querying, that recommends the appropriate query patterns according to the user's querying context.

## REFERENCES

- Kirsh S. M. (2003). *Social Information Retrieval*, PhD Thesis in Computer Science, Friedrich-Wilhelms-Universität, Bonn, Germany, March 14<sup>th</sup> 2003.
- Wasserman, S., & Faust, K. (1994). Ganovetter M., *Social Network Analysis: Methods and Applications*, Cambridge University Press, ISBN 978-0521387071.