

## Preface to the Special Issue on Personalization in Social Web systems

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The new generation of web systems known as Web 2.0 or Social Web systems offers a new challenge to the researchers and practitioners working on Web personalization. An already broad stream of new information created by owners and developers of Web sites and information systems is being joined by another stream of information produced by the users of various kinds of social systems—from user-submitted content in various blogs and wiki sites, to shared bookmarks, pictures, and movies on social bookmarking and tagging sites, to a range of information about users themselves on social networking sites. The need for personalization in Social Web systems is arguably even more important than in traditional Web systems. Not only is the volume of user-contributed information potentially much larger, but also traditional information access infrastructure (such as indexes, directories, information maps) is typically not available in Social Web systems. For example, finding a relevant blog post in a chaotic distributed blogosphere is much harder than finding a relevant news article in a well-organized news site. While sometimes considered a luxury in classic information systems, personalization has become a necessity in Social Web systems.

A number of research groups worldwide have already begun to explore classic personalization techniques in this new context; however, early results frequently demonstrate that a mere reuse of old techniques is not always the best way forward as these technologies may not work efficiently within the new contexts. New ideas, approaches,

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**Table 1** Social domains and data types

Researchers	Domain	Data types				
		Social tags	Social profiles	Shared items	Log data	Social connections
Gena et al.	Recommendation (cultural events)	X			X	
Pirolli and Kairam	Personalized online learning paths	X				
Abel et al.	Recommendation (tags and resources)	X	X			
Shapira et al.	Recommendation (movies, music, etc.)		X			X
Kim and El Saddik	Recommendation (social communities)	X		X		
Loizou and Dimitrova	Adaptive notifications in virtual communities	X		X	X	X

and technologies are required to produce efficient personalized information access technologies for the new context.

Most common for personalization approaches developed in the context of social systems is the focus on leveraging new sources of information that are specific for social systems such as shared items and tags, user public profiles, social connections, and logs of user social activities. These sources offer social personalization systems a chance to compensate for the lack of information and structure that is used by traditional personalization technologies ranging from recommender systems to E-learning. The use of these sources is becoming a signature feature of new social personalization technologies.

The six papers in this special issue present a representative set of approaches that use social data to achieve a variety of personalization goals: recommend various kinds of items, build student models for personalized learning paths through online material, overcome the cold-start problem and the sparse-data problem in recommender systems, generate adaptive notifications to support knowledge sharing in virtual research communities, and suggest relevant communities to join. The presented approaches use a variety of social information sources and their combinations—including social tags, form-based profiles, product mentions on personal Facebook pages, virtual community log data, and social connections. Table 1 summarizes the personalization goals for each paper in this issue and types of social data they use. More details about specific papers are provided below.

The first paper *The Evaluation of a Social Adaptive Web Site for Cultural Events* by Gena et al. evaluates an adaptive social website, iCITY, that provides information about cultural resources and events in the city of Turin. They used data from behavior log files and tagging activity to cluster users and found three emergent clusters: heavy users that frequently viewed events, updated their profile, added friends, clicked on map events, added ratings, changed navigation modes, and sent messages; email users that frequently showed and removed messages, clicked on tags, added favorites, and logged out; single login users that only used iCITY once. Correlation analysis suggests that users either preferred system recommendations or social ones, but not both, and that viewing events are correlated with bookmarking, rating and tagging the

events. The heavy users can be further characterized into the subgroups of consumers and friends for friends' sake users. Email users tend to be social lurkers. These user roles can be used to guide future social website design. A qualitative analysis of user satisfaction questionnaires found that users wanted better accessibility, a more visible open user model, emailing of upcoming events, and integration with other social websites such as route mapping. Finally, the authors' analysis of tag meanings using WordNet synsets showed only a partial match with user interests, so they recommend combining tags with other user actions to get better user models.

In the second paper *A Knowledge-Tracing Model of Learning from a Social Tagging System*, Pirolli and Kairam explore the prospects of using social tags to model user knowledge acquired by reading tagged online material. The paper suggests an interesting combination of technologies from two very different fields. One of the explored technologies is topic modeling based on Latent Dirichlet Allocation (LDA), an emerging approach in the field of text analysis. The other technology is Knowledge Tracing, a popular student modeling approach in the field of Intelligent Tutoring Systems. The specific idea explored in this paper is inducing semantic topics in the domain and using them to assess the knowledge states of users learning in this domain while browsing Web-based resources with the help of the social tagging system SparTag.us.

Abel et al. in the third paper *Cross-system User Modeling and Personalization on the Social Web* combine multiple form-based user profiles with tag-based profiles to address the recommender cold-start problem (when no user profile is available at start-up). Their Mypes service allows users to aggregate Facebook, LinkedIn, Twitter, Delicious, Last.fm, Flickr, BlogSpot, StumbleUpon, and Google profiles. They found that aggregated form-based profiles allowed more complete FOAF and vCard entries than any single site profile. Aggregating tags from multiple sources tends to reveal more facets about users as Flickr tends to contain more geographic tags than the other tagging services, the overlap across services is rather low (on the order of 10% or less), and the average entropy of tags increases when aggregated. By combining tags from other services with the most popular tags from the target service, Mypes was able to generate individual tagsets that better resembled user's actual tagsets than the baseline most popular tagset on the target service based on measures including MRR (mean reciprocal rank), success at rank  $k$ , and precision at rank  $k$ . Accuracy improved as the tagsets from more services were aggregated. The accuracy was also consistently better for the Mypes tagsets than the baseline most popular tagset when users' actual tags were added back in to simulate growth of the target tagsets over time. These results show that the recommender system cold-start problem can be addressed by utilizing tagsets from users' other services.

The fourth paper *Facebook Single and Cross Domain Data for Recommendation Systems* by Shapira et al. attempts to leverage a combination of two kinds of information available on social systems—social connections and user profiles. Unlike the Abel et al. paper that considers a broad range of profile information, Shapira et al. specifically explores the value of favorite items (films, music, books, TV shows, etc.) that users can specify in many social linking systems such as Facebook. The paper reports the results of two studies. The first study compares the quality of recommendations generated using a combination of favorite items and social links with the quality of traditional collaborative filtering. The study shows that the social approach can

produce good recommendation and even outperform traditional approaches in situations when preference data is sparse. The second study specifically explores the prospects of cross-domain recommendation based on multi-domain preferences expressed in Facebook profiles (i.e., could we use information about music favorites for receiving movie recommendation, etc.). The results provide a unique insight on the value of cross-domain information for recommendation and the effectiveness of different approaches to process it.

In the fifth paper, *Exploring Social Tagging for Personalized Community Recommendations*, Kim and El Saddik is also focused on recommender system technologies. However, unlike the other three recommender-oriented papers in this issue that deal with traditional item recommendation, this paper is targeting a less explored area—recommending relevant communities (groups) to the users of social systems. The focus of the paper is the study of the value of tags as a source of information for community recommendation. Using data from two social systems, Last.FM and CiteULike, the paper explores a range of tag-based algorithms and compares them with traditional collaborating filtering approaches.

Loizou and Dimitrova in the sixth paper *Adaptive Notifications to Support Knowledge Sharing in Close-Knit Virtual Communities* use and evaluate adaptive notifications for supporting knowledge sharing in a virtual research community. To encourage participation, improve transaction memory and develop shared mental models, personalized notifications are sent, such as informing a member of his/her interest similarities to another member or encouraging a cognitively central member to continue contributing by mentioning his/her degree of centrality. The effectiveness of the notifications was evaluated by both questionnaires and usage log data. Analysis found that member awareness of the community was improved by the adaptive notifications and users preferred adaptive over non-adaptive notifications.

A deeper look at the papers presented in this issue demonstrate some interesting trends of the social personalization that goes beyond the already mentioned focus on the use of social data. One trend to notice is the opportunity to explore cross-system and cross-domain personalization that is offered by many social systems. This topic is discussed in two articles of this issue. Related to this trend is an attempt to build approaches for more extensive and less domain-dependent user modeling explored in several papers. Finally social systems allowed an interesting opportunity to move user modeling to another level by building community models and using it as another source of personalization—as demonstrated by two papers in this issue.

Altogether, the six articles in this collection show some of the possibilities and challenges for the new generation of Social Web applications and user-generated Social Web data. We hope that this collection will encourage further research in this new Social Web research area.

## Author Biographies

**Peter Brusilovsky** is a Professor and Chair of Information Science at the University of Pittsburgh, where he also directs Personalized Adaptive Web Systems (PAWS) lab. Peter received his Ph.D. degree in Computer Science from the Moscow State University in 1987. He has been working in the field of adaptive educational systems, user modeling, and intelligent user interfaces for more than 25 years. He published

numerous papers and edited several books on user modeling, adaptive hypermedia and the adaptive Web. Peter is a member of editorial board of *User Modeling and User-Adapted Interaction* and several other journals. He served as a general and program chair of several conferences in Adaptive Hypermedia and User Modeling series. He is also the past President of User Modeling Inc.

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