

Recommender Systems in the Web 2.0 Sphere

BY DIETMAR JANNACH AND MARKUS ZANKER

Recommender Systems (RS) are software solutions that help users deal with the information overload and find the information they need. From a technical perspective, RS have their origins in different fields such as information filtering and data mining and are built using a broad array of statistical methods and algorithms. Since their beginnings in the early 1990s, boosted by the enormous growth of the Web, RS have been widely applied in e-commerce settings, with recommendations from the book e-tailer Amazon.com being probably the most prominent example [4]. Systems like this point an individual online visitor to additional interesting items, usually by analyzing their shopping behavior or that of the wider user community. The success of RS is based on the fact that personalized item recommendations can measurably increase overall sales figures on e-commerce sites as shown by a recent study [1], [2].



Fig. 1. Pasadena City Hall (ITWP'09)

The collaborative recommendation paradigm itself can be seen as one of the pioneering applications of what has now come to be known as “Web 2.0” where users are not only consumers of information but also contribute in a democratic way and actively shape the Web by themselves. Thus, the metaphor of a *Social Web* commonly stands for (participatory) media applications like blogs, Wikipedia and other forms of content annotation and sharing as well as social and trust-based networks. In a similar way, collaborative filtering ap-

plications are about sharing opinions on items and benefitting from the ratings and recommendations of other users in a community. Consequently, the abundance of user-generated data that is now available impacts current recommender systems research and practices in a number of different ways. Consider for instance that the prediction accuracy of any RS mostly depends on the amount and quality of information the system has about the customer. In the worst case, the system only has information about the customer’s previous purchases or ratings and this number of purchases might be rather low. In the Web 2.0 era, however, more information about customers like demographics or social relationships may be available which can be exploited by a RS. In Social Web platforms for example, users are often rather willing to reveal personal information, e.g., about their hobbies, book or film preferences or favorite Web sites. Furthermore, such networks consist of explicit *trust* relationships between users that can be relevant for the recommendation process. Note that in addition to more in-depth information about users, more information about the items themselves is also available. Users are often willing to write detailed product reviews or add comments to bookmarks or tag resources, thus providing data that can be exploited by content-based recommendation mechanisms.

In addition to aspects surrounding the exploitation of additional knowledge sources, Web 2.0 also opens new application opportunities for RS technology. While typical Web 2.0 content such as blogs or bookmarks can be recommended to users with the help of classical RS algorithms, the recommendation of contacts on a Social Web platform or the recommendation of tags for resources often requires the development of new approaches. Viewed more generally, there seem to be many opportunities where RS can help to stimulate

participation and sustained membership in Social Web applications.

The recommender systems research community is currently very active. Aside from the different workshops held at major conferences, the newly established ACM Conference on Recommender Systems has already received nearly 200 paper submissions in 2009. In general, recommendation in the Web 2.0 sphere is one of the major topics at all events related to recommender systems research. In this report, we will summarize the issues that were discussed in this context on two focused workshops held in 2009.

I. ITWP'09

The one-day workshop on *Intelligent Techniques for Web Personalization & Recommender Systems* was held on July 11 at IJCAI'09 in Pasadena and was the seventh in a series of successful events held at major Artificial Intelligence conferences since 2001. At this workshop, Recommender Systems were discussed in the context of the more general problem of Web personalization and therefore viewed as a special way of tailoring the Web experience to individual users. Overall, the main goals of the workshop were to bring together people from the different fields, foster the exchange of ideas and discuss current topics in the area.

Paper submissions from 15 different countries were received out of which less than 40% were accepted for full presentation at the workshop. The workshop was organized in four technical sessions in which the seven full papers and the three short papers were presented. With respect to Web 2.0 recommender systems, recent research results were presented in particular in the area of intelligent tag recommendation in folksonomies, the simultaneous exploitation of different information sources for a given recommendation task and the in-

corporation of social and semantic information in a hybrid recommender system.

In addition to the technical paper presentations, the workshop also featured an invited talk given by Barry Smyth of University College Dublin. In his talk on “Personalization and Collaboration in Social Search” Barry Smyth focused on the HeyStaks [5] collaborative Web search system in which users are connected in a social network and can recommend interesting search results to each other. Overall, his talk demonstrated the opportunities for combining approaches from Web search, personalization, recommender systems and the Social Web.

The 2009 workshop ended with an open discussion on current challenges and future developments in the field.

II. RSWEB'09

Due to the increasing interest in recommender systems in the Web 2.0 sphere¹, this year's ACM Recommender Systems conference program also included a dedicated workshop on Recommender Systems & the Social Web (RSWEB'09) for the first time. The workshop was held on October 25 in New York and received more than 20 submissions from 10 different countries and accepted around 50% for full presentation.



Fig. 2. New York skyline (RSWEB'09).

The one-day workshop consisted of both technical paper sessions, which were scheduled in a way that allowed ample time for discussions, as well as

of more informal break-out sessions for brainstorming and discussion on specific subtopics. The papers submitted to the workshop covered a variety of topics in the context of Social Web recommender systems, which can be grouped into the following broad categories.

- Trust-based recommendation: Using trust-statements and explicit relationships in social networks to find similar neighbors and improve recommendation accuracy and coverage.
- Issues in tag recommendations: Improving recommendation accuracy through graph-based and hybrid algorithms; generating appropriate tags from document content.
- Web 2.0 content: Recommendation on social media sites; knowledge-based preference elicitation.

The breakout sessions were devoted to topics such as “What kind of additional knowledge can be leveraged to make recommendations more accurate?” or “To which problems of Web 2.0 and Social Web systems can recommender systems technology be applied and how?”. Overall, the workshop raised strong interest in the research community leading to the situation that not all requests for invitations to the workshop could be satisfied. The timeliness of the topic was also demonstrated by the fact that also at the main conference more than a fourth of the accepted long papers dealt with recommender systems technology in the context of the Social Web.

To summarize, the question of how recommender systems technology can be applied to and is influenced by the developments in Web 2.0, the Social Web and also the Semantic Web is one of the main topics in recommendation research in 2009 and will also continue to be so for the coming years. In that context, the ITWP and RSWEB workshops served as an inspiring platform for the exchange of

ideas and discussion among researchers working on all aspects of recommender systems in the Web 2.0 era and should be repeated in 2010.

REFERENCES

- [1] M. Benjamin Dias, Dominique Locher, Ming Li, Wael El-Deredy, and Paulo J.G. Lisboa. The value of personalised recommender systems to e-business: a case study. In *RecSys '08: Proceedings of the 2008 ACM conference on Recommender systems*, pages 291–294, Lausanne, Switzerland, 2008.
- [2] Dietmar Jannach and Kolja Hegelich. A case study on the effectiveness of recommendations in the mobile internet. In *Proceedings of the 3rd ACM Recommender Systems Conference*, New York, NY, USA, pages 205–208, 2009.
- [3] Dietmar Jannach, Markus Zanker, and Joseph A. Konstan. Special issue on recommender systems. *AI Communications*, 21(2-3):95–96, 2008.
- [4] G. Linden, B. Smith, and J. York. Amazon.com recommendations: item-to-item collaborative filtering. *IEEE Internet Computing*, 7(1):76–80, 2003.
- [5] Barry Smyth, Peter Briggs, Maurice Coyle, and Michael O'Mahony. Google shared. a case-study in social search. In *Proc. 17th International Conference on User Modeling, Adaptation, and Personalization*, pages 283–294, 2009.

Dietmar Jannach is a professor in Computer Science at TU Dortmund, Germany and chair of the e-Services Research Group. His main research interests lie in the application of artificial intelligence and knowledge-based systems technology to real-world problems in particular in e-business environments. He has authored numerous papers on intelligent sales support systems such as recommender systems or product configurators. Dietmar Jannach was also one of the co-founders of ConfigWorks GmbH, a company focusing on next-generation interactive recommendation and advisory systems. He was a co-chair and organizer of the ITWP workshop at IJCAI'09 and the ACM RecSys'09 Workshop on RS and the Social Web.

Markus Zanker is an assistant professor at the Department for Applied Informatics at the University of Klagenfurt, Austria and is a co-founder and director of ConfigWorks GmbH, a provider of interactive selling solutions. He received his MS and doctorate degree in computer science and MBA in business administration from Klagenfurt University. His research interests lie in the area of knowledge-based systems, in particular in the fields of interactive sales applications such as product configuration and recommendation. Markus Zanker will be a program co-chair at the 4th ACM Conference on Recommender Systems to be held in Barcelona, Spain in 2010.

¹See also the recent AI Communications Special Issue on Recommender Systems [3] that featured several papers on this topic.