

Research on Recommender Systems in E-commerce: The Status quo & the Future



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Outline

- Overview
- Research Topics
 - User modeling & User interfaces
 - Recommendation algorithms
 - Understanding and trusting recommender systems
 - Social consequences and opportunities of recommenders
- Future research



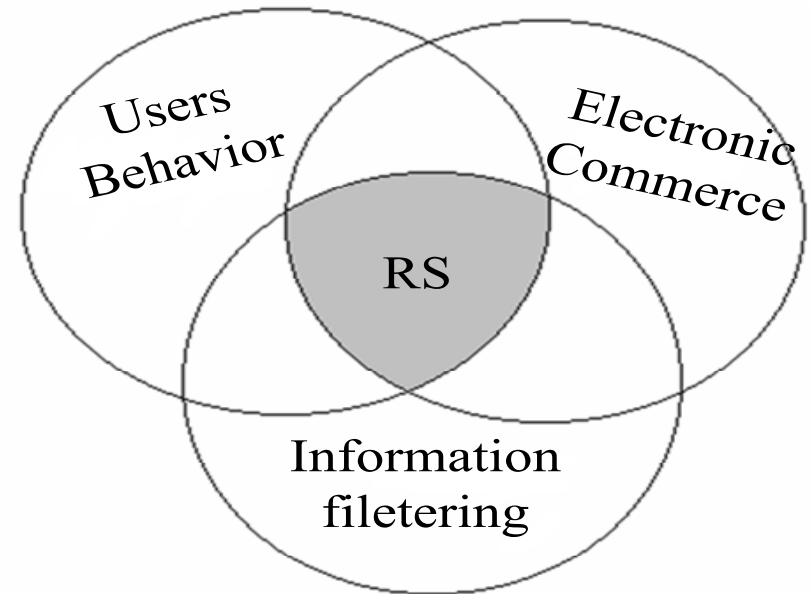
What are Recommender systems?

- Recommender systems (RS) form a specific type of information filtering (IF) technique that recommend items of interest to users based on preferences they have expressed, either explicitly or implicitly.
- RS help overcome the information overload problem by exposing users to the most interesting items, and by offering novelty, surprise, and relevance.

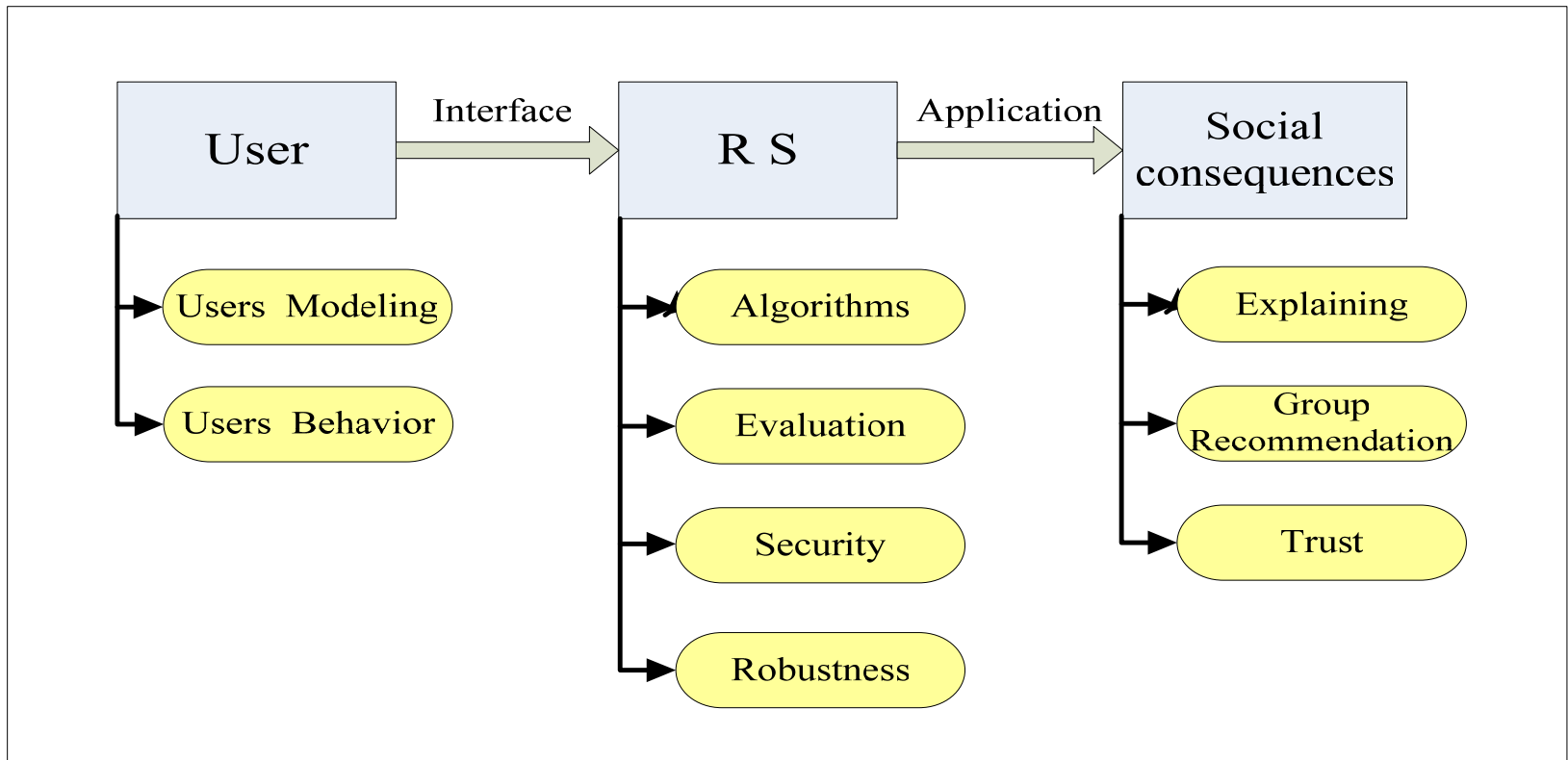
Inter-disciplinary field

- Inter-disciplinary field
 - Electronic Commerce
 - Users Behavior research
 - Information filtering

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Research topics





Research Methodology

- Design research
- Laboratory Experiment
- Survey
- Case study
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User modeling & User interfaces



- RS relies on a user profile, filter away irrelevant information so that only the information most catering for user's interests is advised to him/her.
- User modeling, which concerns building and maintaining user profile, represents a crucial step in the development of personalized recommender systems.



User modeling & User interfaces

Research Problems:

- Group modeling, visualization modeling
- Good ways to present recommendations to users
- Integrate recommenders into the displays of existing information systems
- Get users to consume the items recommended
- Tell the system how good the recommendations are



User modeling Methods

- Statistical keyword analysis
- Multi-agent technique
- Incremental clustering approaches
- Neural networks
 - [Wu Lihua, Liu Lu et al. 2005] designed a clustering model based on the growing cell structures neural network to address user's multiple interests problem.
- Ontological approach



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Recommendation algorithms

Recommender systems are usually classified into the following categories, based on how recommendations are made [M. Balabanovic et al., 1997]:

- Content-based recommendations
- Collaborative recommendations
- Hybrid approaches



Recommendation algorithms

- Content-based recommendations limitations
 - Limited Content Analysis
 - Overspecialization
 - New User Problem
- Collaborative recommendations limitations
 - New User Problem
 - New Item Problem
 - Sparsity

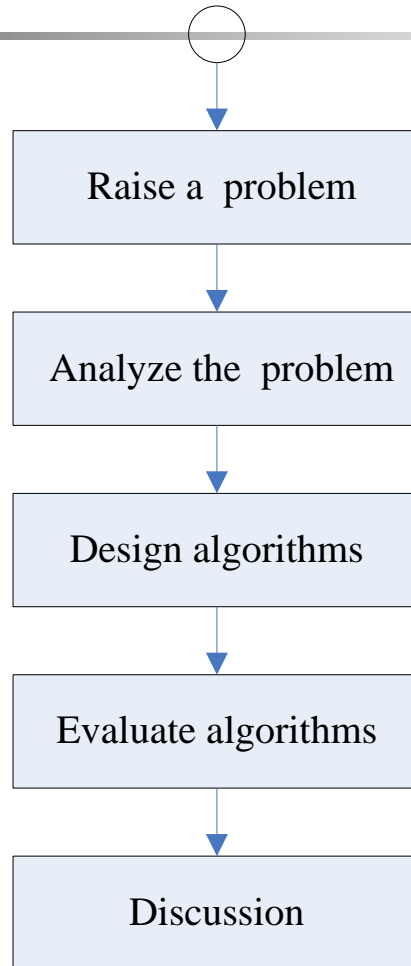


Recommendation algorithms

Research Problems:

- Develop new algorithms
- Generate better individual and group recommendations
- Achieve cross-domain recommendations
- Classical problems, i.e. new user, new item

Recommendation algorithms





Algorithms: An Example



ELSEVIER

Expert Systems with Applications 28 (2005) 67–77

Expert Systems
with Applications

www.elsevier.com/locate/eswa

A hybrid collaborative filtering method for multiple-interests
and multiple-content recommendation in E-Commerce[☆]

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Research Process

- Raise a problem
 - Collaborative filtering based on user is not adaptive to Multiple-interests and Multiple-content recommendation
- Analyze the problem
 - CFS failed because the predicted item for active user is not consist with the common interests of his neighbor users
- Design algorithms
 - Explored a hybrid collaborative filtering method, by combining collaborative filtering based on item and collaborative filtering based on user together.



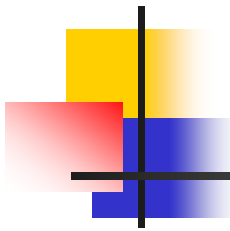
Research process

- Evaluate algorithms
 - Datasets
 - Evaluation metrics
 - Experimental procedure
 - Compare them with collaborative filtering based on user and collaborative filtering based on item, respectively.
 - Results
 - The proposed algorithm provides better recommendation quality
- Discussion



Outline

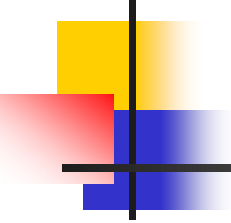
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Understanding and trusting recommender systems

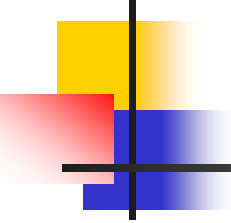
Research problems

- Do users understand and trust the recommendations?
- What kinds of information do RS need to provide to users to build trust?
- How difficult is it to regain trust in a recommender if it is lost?



Understanding and trusting recommender systems

- In order for users to benefit, they must trust the system's recommendations and accept them.
- A system's ability to explain its recommendations can contribute significantly to users' acceptance of its suggestions.
- For medicine and other tasks, systems' ability to explain their reasoning has been found to be critical to users' acceptance.



Understanding and trusting recommender systems

- Effective Explanations
 - Explanations of recommendations can play an important role in improving the user experience.
 - Good explanations could help inspire user trust and loyalty, increase satisfaction, [Tintarev et al.,2007]



Outline

- Overview

- Current Research Topics

- User modeling & User interfaces
- Recommendation algorithms
- Security and robustness problems
- Understanding and trusting recommender systems
- Social consequences and opportunities of recommenders

- Future research



Social consequences and opportunities of recommenders

- How do individuals and groups respond to recommendations?
- How can recommendations be integrated with online and real world communities?
- In what ways do recommendations affect social organizations?



Social consequences and opportunities of recommenders

- Group recommendation system

- As on-line community activities have increased exponentially, group recommendation system has also become more and more imperative.
- A few group recommender systems have been designed [Masthoff, 2002; McCarthy et al, 1998; O'Connor et al., 2001].
- [Chen et al., 2007] proposed a novel group recommendation system to incorporate interactions among group members.



Social consequences and opportunities of recommenders

■ Marketing tools

- Recommender systems are usually used as virtual sales people, rather than as marketing tools.
- [Lee et al., 2007] propose a novel recommender system, labeled VCR—virtual community recommender, recommends optimal virtual communities for an active user
- [Hsu, 2007] proposed teaching and learning recommender system.



Social consequences and opportunities of recommenders

- Impact on Sales Diversity
 - [Senecal et al. 2004] show experimentally that recommendations do influence choice.
 - Two anecdotal views exist about such effects.
 - RS help consumers discover new products and thus increase sales diversity (e.g., Brynjolfsson, 2006).
 - A small number of others don't think so.



Outline

- Overview
- Current Research Contents
 - User modeling & User interfaces
 - Recommendation algorithms
 - Understanding and trusting recommender systems
 - Social consequences and opportunities of recommenders
- The future research



The future-Research topics

- User modeling
 - Group modeling, visualization modeling, Data mining
- User interface
 - User control over recommendation data
 - Good ways to present recommendations
 - User's interaction with RS
- Recommendation algorithms
 - Develop new algorithms
 - Achieve cross-domain recommendations
 - Classical problems, i.e. new user, new item



The future-Research topics

- Understanding and trusting recommender systems
 - Effective Explanations
 - trust the system's recommendations and accept them
- Social consequences and opportunities of recommenders
 - Group recommendation
 - Marketing tools
 - Impact on sales diversity
 - User behavior research



Future Research Trends: Expand application domain

- Applied to a wide spectrum of domains not limited to the products.
- Recommender customers to enterprise
- A few recent systems have incorporated social network information to further extend the recommendation scope.
- [Wan-Shiou Yang et al.,2007] proposed a framework that utilizes the concept of a social network for the targeted advertising of products.

Future Research Trends:

knowledge-based recommendation

- From information to knowledge
- Knowledge-based recommender recommendation exploit deep knowledge about customers, products and the application domain when making recommendations.
- [Lorenzi, 2007] proposed the use of a multi-agent knowledge-based recommender approach capable of dealing with distributed expert knowledge in order to support travel agents in recommending tourism packages.



Research Groups

- GroupLens: focus on collaborative filtering (CF) and its integration into various applications, University of Minnesota
- IFI DBIS: Next Generation Recommender Systems developed the novel Topic Diversification method to overcome the diversity issue, University of Freiburg, Germany,
- IAM Group: Recommender Systems, Ontologies, Semantics
Uses pearson-r correlation to recommend and kNN classification to profile user interests. An ontological approach is taken to represent user profiles, University of Southampton, United Kingdom
- LIBRA: Learning Intelligent Book Recommending
LIBRA is a new project on using machine learning to recommend books to readers by learning a profile of their interests. University of Texas at Austin



Journal Special Issues & Workshops

■ ACM Recommender Systems Series

- [2nd ACM International Conference on Recommender Systems, 2008](#)
- [ACM Recommender Systems 2007](#)
- [Recommenders06: Summer School on The Present and Future of Recommender Systems](#)

■ Journal Special Issues

- [AI Communications Special issue on Recommender Systems: call for papers, 2008](#)
- [IEEE Intelligent Systems Special Issue on Recommender Systems, Vol. 22\(3\), 2007](#)
- [International Journal of Electronic Commerce Special Issue on Recommender Systems, Volume 11, Number 2 \(Winter 2006-07\)](#)
- [ACM Transactions on Computer-Human Interaction \(TOCHI\) Special Section on Recommender Systems Volume 12, Issue 3 \(September 2005\)](#)
- [ACM Transactions on Information Systems \(TOIS\) Special Issue on Recommender Systems, Volume 22, Issue 1 \(January 2004\)](#)

■ Workshops

- [ICADIWT 2008 - First International Workshop on Recommender Systems and Personalized Retrieval](#)
- [ECAI'08 - Workshop on Recommender Systems](#)
- [ReColl'08 - International Workshop on Recommendation and Collaboration](#)
- [AAAI'07 Workshop on Recommender Systems in e-Commerce](#)
- [WI'07 Workshop on Web Personalization and Recommender Systems](#)
- [ECAI 2006 Workshop on Recommender Systems](#)

Recommender Systems Application

In commercial systems

- [Amazon](#) -book
- [Barnes and Noble](#) –book
- [LibraryThing](#) - books
- [Netflix](#) -DVD
- [TiVo](#) -digital video
- [Hollywood Video](#) -movie and video game
- [iLike](#) - music
- [iTunes](#) - music
- [Musicmatch](#) -music
- [MyStrands](#) - music
- [Minekey](#) – Blog
- [Baynote](#) – website
- [StumbleUpon](#) - websites

In non-commercial systems

- [AmphetaRate](#) -RSS articles
- [Everyone's a Critic](#) - movies
- [GiveALink.org](#) -websites
- [Gnomoradio](#) -music (free)
- [iRATE radio](#) -music (free)
- [Musicmobs](#) -music
- [Rate Your Music](#) -music



Thank you for your attention!

Q & A ?