



User Model In a Box: Cross-System User Model Transfer for Resolving Cold Start Problems

Chirayu Wongchokprasitti¹, **Jaakko Peltonen**^{2,3},
Tuukka Ruotsalo², Payel Bandyopadhyay⁴,
Giulio Jacucci⁴, Peter Brusilovsky¹

¹School of Information Sciences, University of Pittsburgh

²Helsinki Institute for Information Technology HIIT, Aalto University

³School of Information Sciences, University of Tampere

⁴Helsinki Institute for Information Technology HIIT, Department of Computer Science, University of Helsinki

In Brief:

- We compare methods of **cross-system user model transfer**

In Brief:

- We compare methods of **cross-system user model transfer**
- Two large real-life systems:

SciNet for scientific document search

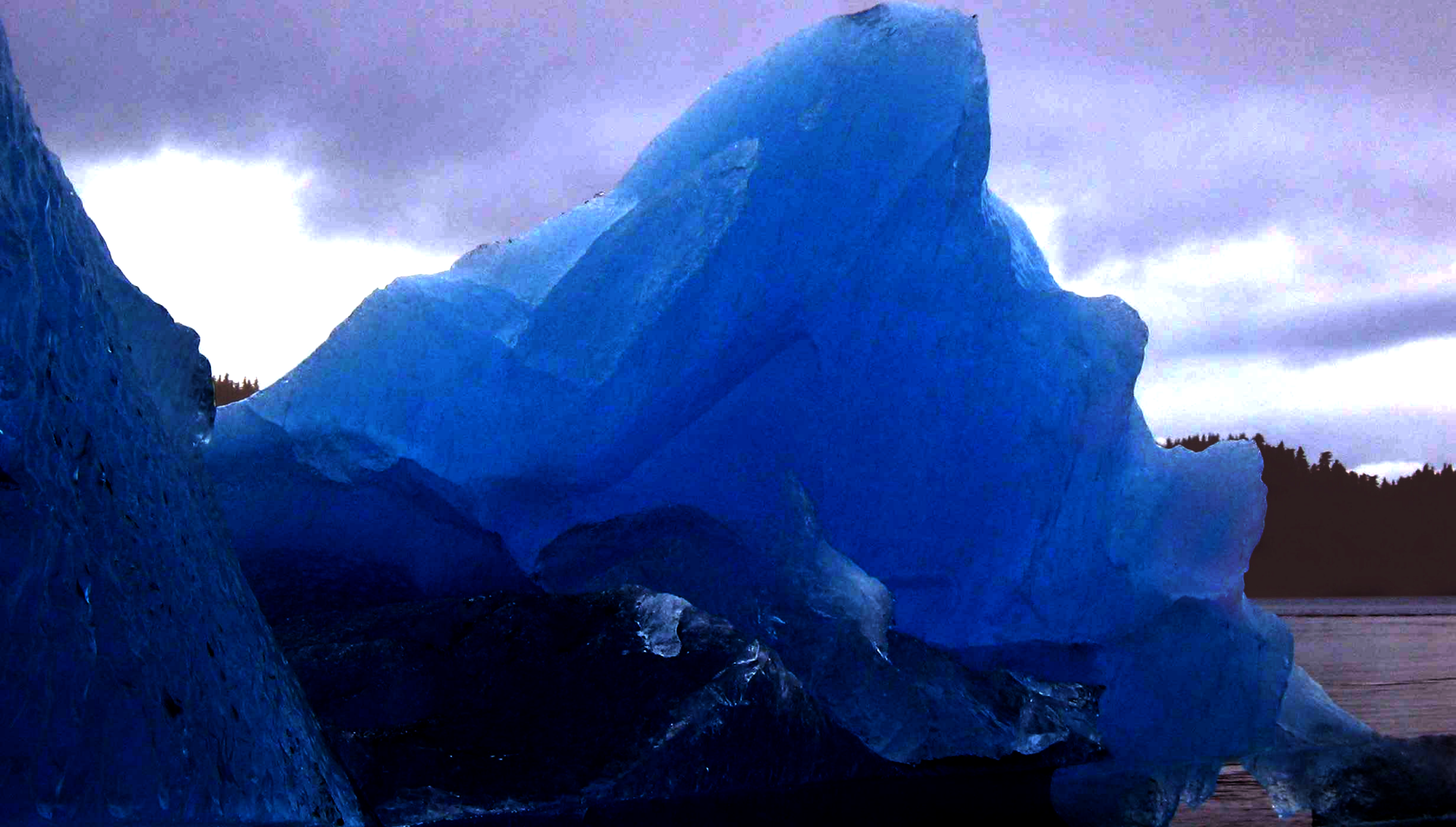
CoMeT for managing scientific talks

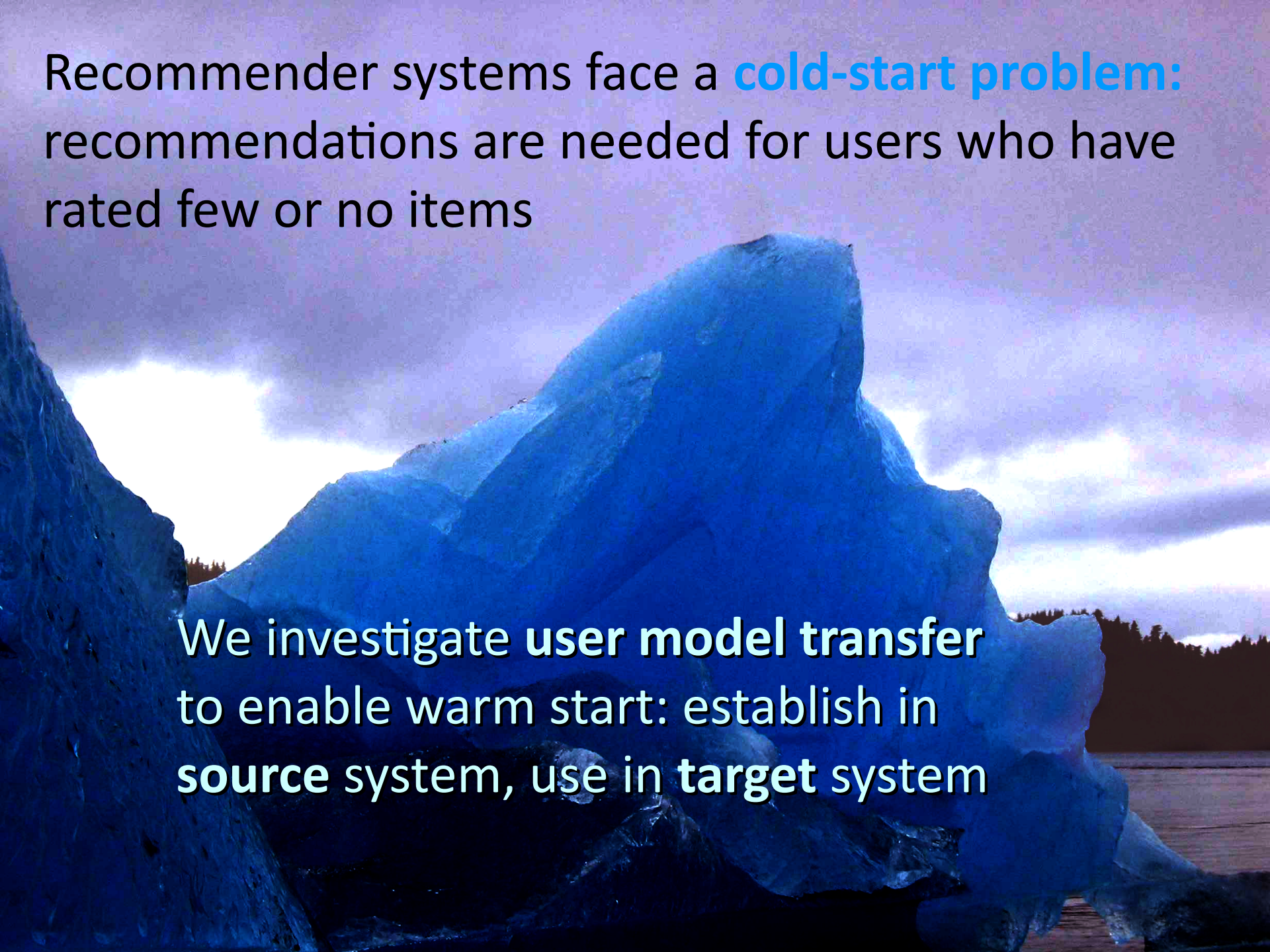
In Brief:

- We compare methods of **cross-system user model transfer**
- Two large real-life systems:
 - SciNet** for scientific document search
 - CoMeT** for managing scientific talks
- transfer of novel **explicit open user models**
(curated by user during information seeking)
strongly improves **cold-start talk recommendation**



Recommender systems face a **cold-start problem**:
recommendations are needed for users who have
rated few or no items



A large, jagged iceberg floats in the ocean under a cloudy sky. The iceberg is the central focus, with its sharp peaks and deep crevices clearly visible. The water is a deep blue, and the sky is filled with soft, white clouds. In the background, a dark line of trees is visible on the horizon.

Recommender systems face a **cold-start problem**:
recommendations are needed for users who have
rated few or no items

We investigate **user model transfer**
to enable warm start: establish in
source system, use in **target** system

Cross-system/domain recommendation has grown in popularity, but still few studies exploring real information transfer (lack of paired users across systems).

Major focus has been on approaches not assuming common users. Major approaches: collaborative filtering or content-based.

Results mixed, especially content-based has been hard. Focus has been on settings having shared semantic features (social tags, Wikipedia).

We expand earlier research by exploring transferability of **open user models** across related but different domains.

Users of the source system can **explore** and **curate** their model by **visual interaction**.



better quality user models, valuable for cross-system transfer

1st work exploring transferability of open user models.

Contributions:

1) cross-system transfer of open user models greatly improves cold-start recommendation

2) we investigate **ways of transferring** open user models, as well as transfer of more traditional implicit and explicit document information.

Open user models bring greatest benefit. We explain it by analysis of cross-system similarities of the different information types.

Academic Information Setting





- Academic users attend **research talks**.
- **A talk management system** can recommend interesting talks given the user's preference.
- Relatively many talks but few bookmarks and ratings (Farzan et al., 2008)
- **New users face the cold start problem**
- Academic users also **search for scientific documents** in a scientific search system. Can its user model help talk recommendation?

Target system: CoMeT system for talk management and recommendation


« Day Week Month »

Week 5 of March: March 24 - 30, 2013

Monday, Mar 25

4 bookmarks	<p>New Algorithms for Nonnegative Matrix Factorization and Beyond  Bookmarked Unbookmark</p> <p>By: Ankur Moitra Subscribe, School of Mathematics Institute for Advanced Study Princeton University at: 10:00 AM - 11:30 AM</p> <p>Location: 6115 Gates and Hillman Centers</p> <p>Keywords: algorithm factorization machine learning</p> <p>Posted to groups: Big Data Intelligent Systems Program Machine Learning Group PAWS Group</p> <p>Bookmarked by: Yun Huang chirayu Peijun Ren zhigang</p>	
5 bookmarks	<p>One-Way Mirrors and Weak-Signaling in Online Dating:A Randomized Field Experiment Recommended</p> <p>Bookmark</p> <p>By: Jui Ramaprasad Subscribe, McGill University, Montreal, Quebec at: 12:00 PM - 1:20 PM</p> <p>Location: Hamburg Hall 1502</p> <p>Posted to groups: Human-Centered Computing Social Computing</p> <p>Bookmarked by: Shenghua Zhang Jie Wang kainan Jin Gan Gan fan</p> <p>Series: Tepper IS Seminar Subscribed Unsubscribe</p>	
21 views	<p>Theoretical Connections Between Convex Optimization and Active Learning Recommended</p> <p>Bookmark</p> <p>By: Aaditya Ramdas Subscribe, Machine Learning Department at: 12:00 PM - 1:00 PM</p> <p>Location: Gates Center 6115</p> <p>Posted to groups: Intelligent Systems Program Machine Learning Group</p> <p>Series: Machine Learning Lunch seminar at Carnegie Mellon Subscribed Unsubscribe</p>	
34 views	<p>Higgs Results: Unveiling the Mystery of Mass Bookmark</p> <p>By: Christoph Paus Subscribe, MIT at: 4:30 PM - 5:30 PM</p> <p>Location: 7500 Wean Hall, CMU</p> <p>Series: Physics CMU Seminar Subscribe</p>	


Tuesday, Mar 26

55 views	<p>Equating Observed-Scores: The Percentile Rank, Gaussian Kernel, and IRT Observed-Score Equating Methods Recommended Bookmark</p> <p>By: Alina A. von Davier Subscribe, Educational Testing Service at: 9:30 AM - 5:00 PM</p> <p>Location: Carnegie Mellon University, University Center, Rangos 2</p> <p>Posted to groups: Intelligent Systems Program</p>	
-------------	--	---

< March 2013 >						
S	M	T	W	T	F	S
24	25	26	27	28	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31	1	2	3	4	5	6
1 - 5 6 - 10 11 - 20 21+						

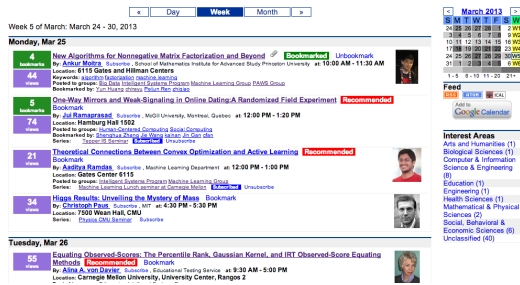
Feed

[RSS](#)
[ATOM](#)
[ICAL](#)

Add to 

- Interest Areas**
- Arts and Humanities (1)
 - Biological Sciences (1)
 - Computer & Information Science & Engineering (8)
 - Education (1)
 - Engineering (1)
 - Health Sciences (1)
 - Mathematical & Physical Sciences (2)
 - Social, Behavioral & Economic Sciences (6)
 - Unclassified (40)

Target system: CoMeT system for talk management and recommendation



System for sharing information about research talks at Carnegie Mellon University and University of Pittsburgh.

- Available online: halley.exp.sis.pitt.edu/comet/
- Collaborative tagging system: anyone can announce, find, bookmark, and tag talks.
- Has **content-based recommender** - builds interest profile of individual users, recommends new talks to users immediately when posted.

Academic Information Setting

- We use CoMeT as the **target system**
- Academic users also **search for scientific documents** in a scientific search system. Can its user model help talk recommendation?
- Unlike traditional search systems (e.g. Google Scholar, Microsoft Academic Search, Citeseer), as the **source system** we use a recent search system having an **open user model**

Google recommendation

Scholar About 2,400,000 results (0.08 sec) My Citations

Articles

Creep and shrinkage prediction model for analysis and design of concrete structures-model B3 [PDF] from northwestern.edu
 RD Recommendation, PDER DE LA RILEM - Mater. Struct, 1995 - Springer
 1. SUMMARY A model for the characterization of concrete creep and shrinkage in the design of concrete structures is recommended. It is simpler, agrees better with the experimental data and is justified better theoretically than the previous models. The model ...
 Cited by 432 Related articles All 5 versions Cite Save

[CITATION] Determination of the Fracture Energy of Mortar and Concrete by Means of Three-Point Bend Tests on Notched Beames
 RD Recommendation - Materials and Structures, 1985 - ci.nii.ac.jp
 ... Determination of the Fracture Energy of Mortar and Concrete by Means of Three-Point Bend Tests on Notched Beames. RILEM Draft Recommendation(50-FMC); 集引用文献: 3件. 収録刊行物: Materials and Structures Materials and Structures 18(108), 285-290, 1985. ...
 Cited by 399 Related articles All 5 versions Cite Save More

[CITATION] 1225
 I Recommendation - Guidelines for evaluation of radio transmission, 1997
 Cited by 380 Related articles Cite Save

Physical activity and public health: a recommendation from the Centers for Disease Control and Prevention and the American College of Sports Medicine [HTML] from cdc.gov
 RR Pate, M Pratt, SN Blair, WL Haskell, CA Macera... - Jama, 1995 - jama.jamanetwork.com
 Objective.—To encourage increased participation in physical activity among Americans of all ages by issuing a public health recommendation on the types and amounts of physical activity needed for health promotion and disease prevention. Participants.—A planning ...
 Cited by 7786 Related articles All 21 versions Cite Save More

[CITATION] 1116-1: Methods for the subjective assessment of small impairments in audio systems including multichannel sound systems
 I Recommendation - International Telecommunication Union, Geneva, 1997
 Cited by 228 Related articles Cite Save

Any time
 Since 2015
 Since 2014
 Since 2011
 Custom range...

Sort by relevance
 Sort by date

Include patents
 Include citations

Create alert

Google Scholar

Microsoft Academic Search recommendation Fields of Study Advanced Search

Academic > Results for "recommendation" in All Fields of Study

Were you looking for these authors:

RECOMMEND COUNTY Recommend Loading Twiddy Recommends

Publications (437125) any time

Structural equation modeling in practice: A review and recommended two-step approach (Citations: 5098)
 James C. Anderson, David W. Gerbing
 In this article, we provide guidance for substantive researchers on the use of structural equation modeling in practice for theory testing and development. We present a comprehensive, two-step modeling approach that employs a series of nested models and sequential chi-square difference tests. We discuss the comparative advantages of this approach over a one-step approach. Considerations in specification, ...
 Journal: Psychological Bulletin - PSYCHOL BULL, vol. 103, no. 3, pp. 411-423, 1988

Physical activity and public health. A recommendation from the Centers for Disease Control and Prevention and the American College of Sports Medicine (Citations: 1989)
 R. R. Pate
 Journal: Jama-journal of The American Medical Association - JAMA-J AM MED ASSN, vol. 273, no. 5, pp. 402-407, 1995

Recommendations for quantitation of the left ventricle by two-dimensional echocardiography (Citations: 1183)
 Nb Schiller, Pm Shah, M Crawford
 Published in 1989.

Recommender systems (Citations: 1050) View...
 Paul Resnick, Hal R. Varian

Medicine (160824)
 Computer Science (50806)
 Biology (32435)
 Engineering (27555)
 Social Science (25026)
 Economics & Business (16477)
 Environmental Sciences (11184)
 Physics (9012)
 Agriculture Science (8754)
 Geosciences (8752)
 Chemistry (8751)
 Material Science (3957)
 Mathematics (3810)
 Arts & Humanities (2190)
 Multidisciplinary (84046)

Microsoft Academic Search

Documents Authors Tables Donate MetaCart Sign up Log In

CiteSeer^x_{5M}

recommendation Search
 Include Citations Advanced Search

Results 1 - 10 of 932,079

Next 10 →

Fab: Content-based, collaborative recommendation

by Marko Balabanovic, Yoav Shoham - *Communications of the ACM*, 1997
 "... Fab is a recommendation system designed to help users sift through the enormous amount of information available in the World Wide Web. Operational since Dec. 1994, this system combines the content-based and collaborative methods of recommendation in a way that exploits the advantages of the two appr ..."
 Abstract - Cited by 561 (0 self) - Add to MetaCart

Evaluating collaborative filtering recommender systems

by Jonathan L. Herlocker, Joseph A. Konstan, Loren G. Terveen, John T. Riedl - *ACM TRANSACTIONS ON INFORMATION SYSTEMS*, 2004
 "..."
 Abstract - Cited by 691 (17 self) - Add to MetaCart

Item-based Collaborative Filtering Recommendation Algorithms

by Badrul Sarwar, George Karypis, Joseph Konstan, John Riedl - *PROC. 10TH INTERNATIONAL CONFERENCE ON THE WORLD WIDE WEB*, 2001
 "..."
 Abstract - Cited by 829 (29 self) - Add to MetaCart

Toward the next generation of recommender systems: A survey of the state-of-the-art and possible extensions

by Gediminas Adomavicius, Alexander Tuzhilin - *IEEE TRANSACTIONS ON KNOWLEDGE AND DATA ENGINEERING*, 2005
 "... This paper presents an overview of the field of recommender systems and describes the current generation of recommendation methods that are usually classified into the following three main categories: content-based, collaborative, and hybrid

Tools

Sorted by:
 Relevance

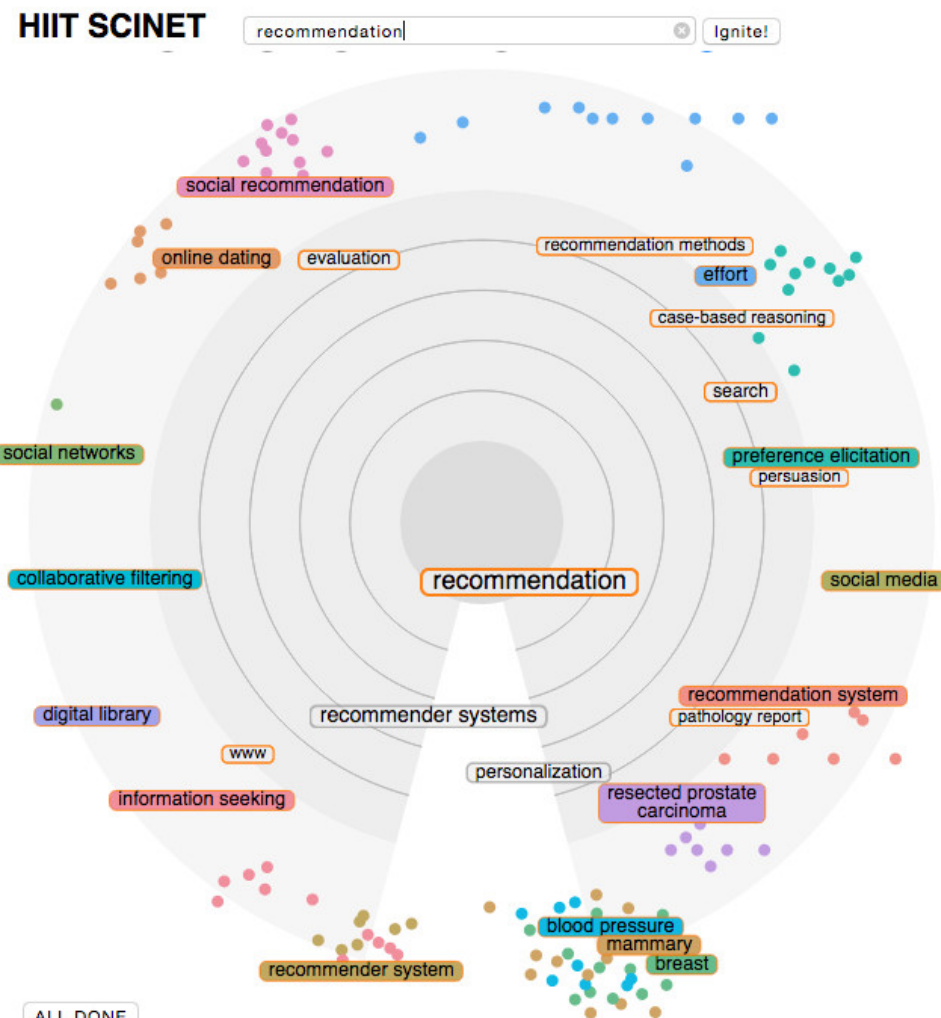
Try your query at:

Scholar Yahoo! DBLP

Bing CSB Academic

CiteSeer

Source system: SciNet system for interactive exploratory search of scientific documents



Articles [\[show bookmarked \(0\)\]](#)

new [Recommendations on recommendations](#)

Rolf Molich, Kasper Hornbaek, Josephine Scott (Conference on Human Factors in Computing Systems, 2007-01-01)

evaluation usability comment usability recommendation usability test problems usability testing user interface recommendation

This interactive session discusses the q...

new [The Universal Recommender](#)

Jérôme Kunegis, Alan Said, Winfried Umbrath (arXiv.org, 2009-01-01)

recommender systems recommendation

We describe the Universal Recommender, a...

new [On recommending](#)

J Furner (JOURNAL OF THE AMERICAN SOCIETY FOR INFORMATION SCIENCE AND TECHNOLOGY, 2002-01-01)

personalization information seeking recommendation

The core of any document retrieval syste...

new [Recommendations for reforming prostatic specimens](#)

V Molinie, A Vieillefond, B Cochand-Priollet, M C Dauge-Geffroy, M A Lefrere-Belda, M De Fromont, A Lesourd, M Toublanc, N Berger, R Bouvier, A Villers (ANNALES DE PATHOLOGIE, 1999-01-01)

prostate cancer pathological form recommendation macroscopic examination histological examination prostate cancer

The purpose of these recommendations pro...

new [Recommendations for the reporting of breast carcinoma](#)

J L Connolly, R E Fechner, R L Kempson, V A Livolsi, D L Page, A A Patchefsky, S G Silberberg (AMERICAN JOURNAL OF CLINICAL PATHOLOGY, 1995-01-01)

breast carcinoma mammary recommendation

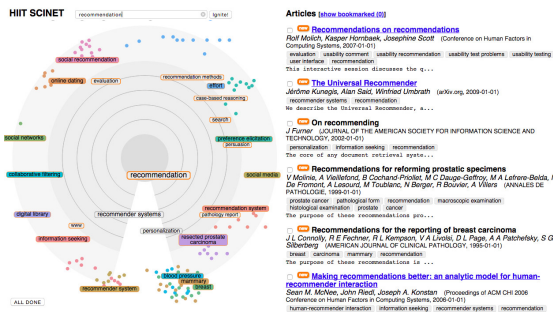
The purpose of these recommendations is ...

new [Making recommendations better: an analytic model for human-recommender interaction](#)

Sean M. McNee, John Riedl, Joseph A. Konstan (Proceedings of ACM CHI 2006 Conference on Human Factors in Computing Systems, 2006-01-01)

human-recommender interaction information seeking recommender systems recommendation

Source system: SciNet system for interactive exploratory search of scientific documents



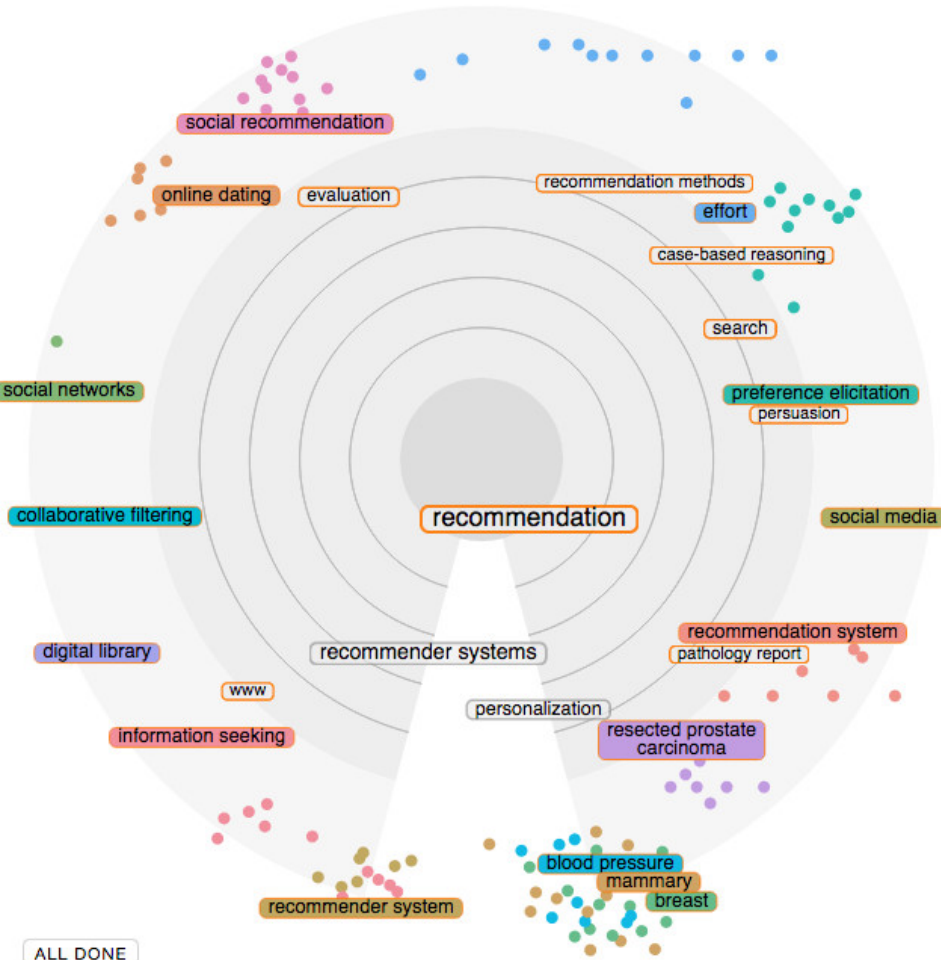
Exploratory search system. Indexes over 50m scientific documents from Thomson Reuters, ACM, IEEE & Springer

- Goes beyond text-based queries.
- User can direct exploratory search by interacting with an open user model.
- Significantly improves information seeking task performance and quality of retrieved information.
- Open user models are promising for cross-system transfer.

SciNet opens its user model: users can interact with a visualization of the model, and curate the model by feedback.

HIIT SCINET

recommendation Ignite!



Articles [\[show bookmarked \(0\)\]](#)

new [Recommendations on recommendations](#)

Rolf Molich, Kasper Hornbaek, Josephine Scott (Conference on Human Factors in Computing Systems, 2007-01-01)

evaluation usability comment usability recommendation usability test problems usability testing user interface recommendation

This interactive session discusses the q...

new [The Universal Recommender](#)

Jérôme Kunegis, Alan Said, Winfried Umbrath (arXiv.org, 2009-01-01)

recommender systems recommendation

We describe the Universal Recommender, a...

new [On recommending](#)

J Furner (JOURNAL OF THE AMERICAN SOCIETY FOR INFORMATION SCIENCE AND TECHNOLOGY, 2002-01-01)

personalization information seeking recommendation

The core of any document retrieval syste...

new [Recommendations for reforming prostatic specimens](#)

V Molinie, A Vieillefond, B Cochand-Priollet, M C Dauge-Geffroy, M A Lefrere-Belda, M De Fromont, A Lesourd, M Toub Blanc, N Berger, R Bouvier, A Villers (ANNALES DE PATHOLOGIE, 1999-01-01)

prostate cancer pathological form recommendation macroscopic examination histological examination prostate cancer

The purpose of these recommendations pro...

new [Recommendations for the reporting of breast carcinoma](#)

J L Connolly, R E Fechner, R L Kempson, V A Livolsi, D L Page, A A Patchefsky, S G Silberberg (AMERICAN JOURNAL OF CLINICAL PATHOLOGY, 1995-01-01)

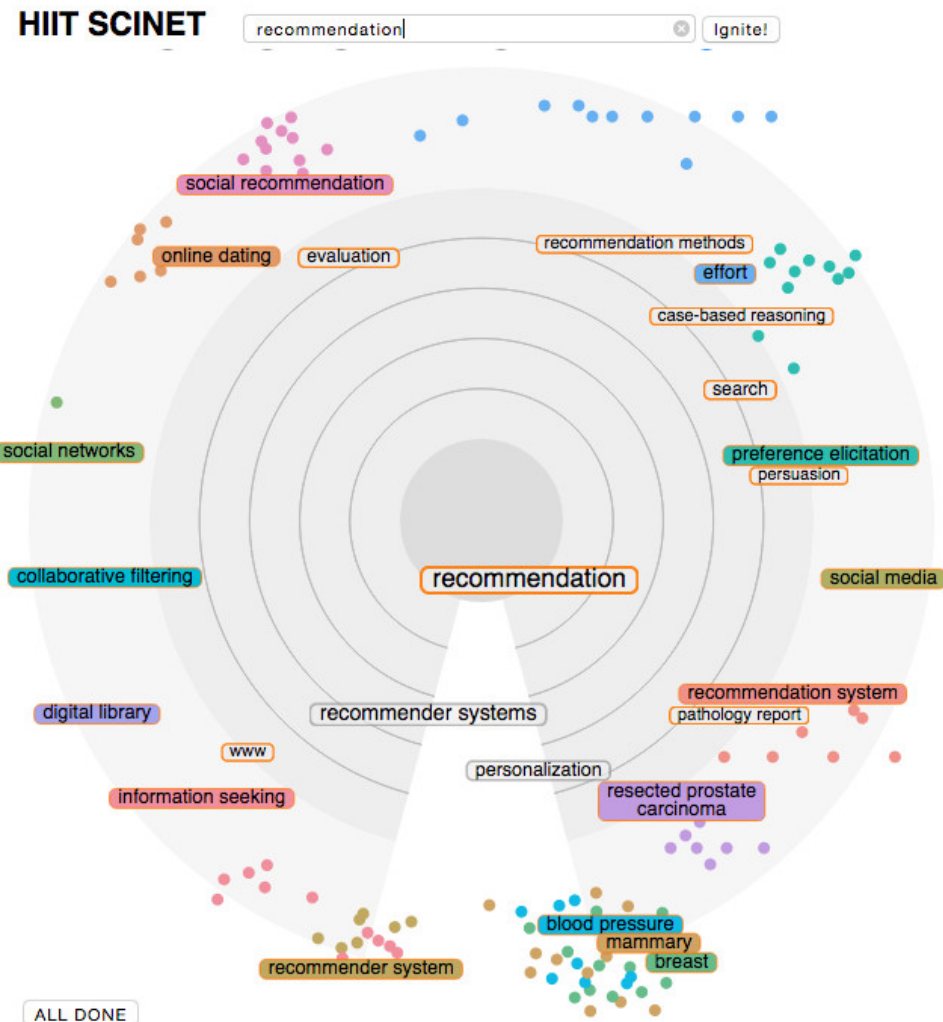
breast carcinoma mammary recommendation

The purpose of these recommendations is ...

new [Making recommendations better: an analytic model for human-recommender interaction](#)

Sean M. McNee, John Riedl, Joseph A. Konstan (Proceedings of ACM CHI 2006 Conference on Human Factors in Computing Systems, 2006-01-01)

human-recommender interaction information seeking recommender systems recommendation



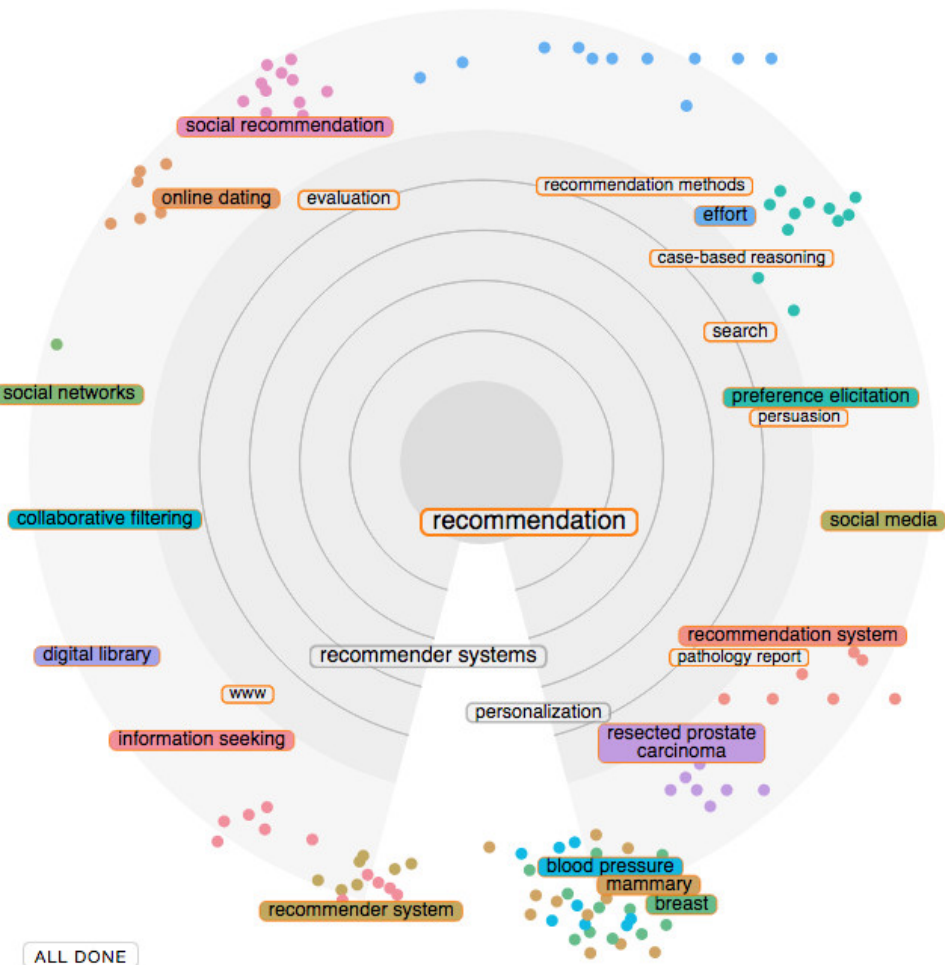
User intent modeled as vector of interests over keywords.

Predicted interests visualized, organized by correlation of interest wrt. future feedback.

Users can drag keywords to change their importance.

A new model is inferred from user feedback. Documents and keyword display change.





Technically:

- model is inferred by Bayesian inference of a linear predictor of user interest over keywords, fitted to feedback.
- Exploration-exploitation is modeled by taking upper confidence bounds of keyword relevances.
- Keywords visualized by dimensionality reduction of their relevances across future feedback.

Ways of Transferring a User Model

Our interest is to use

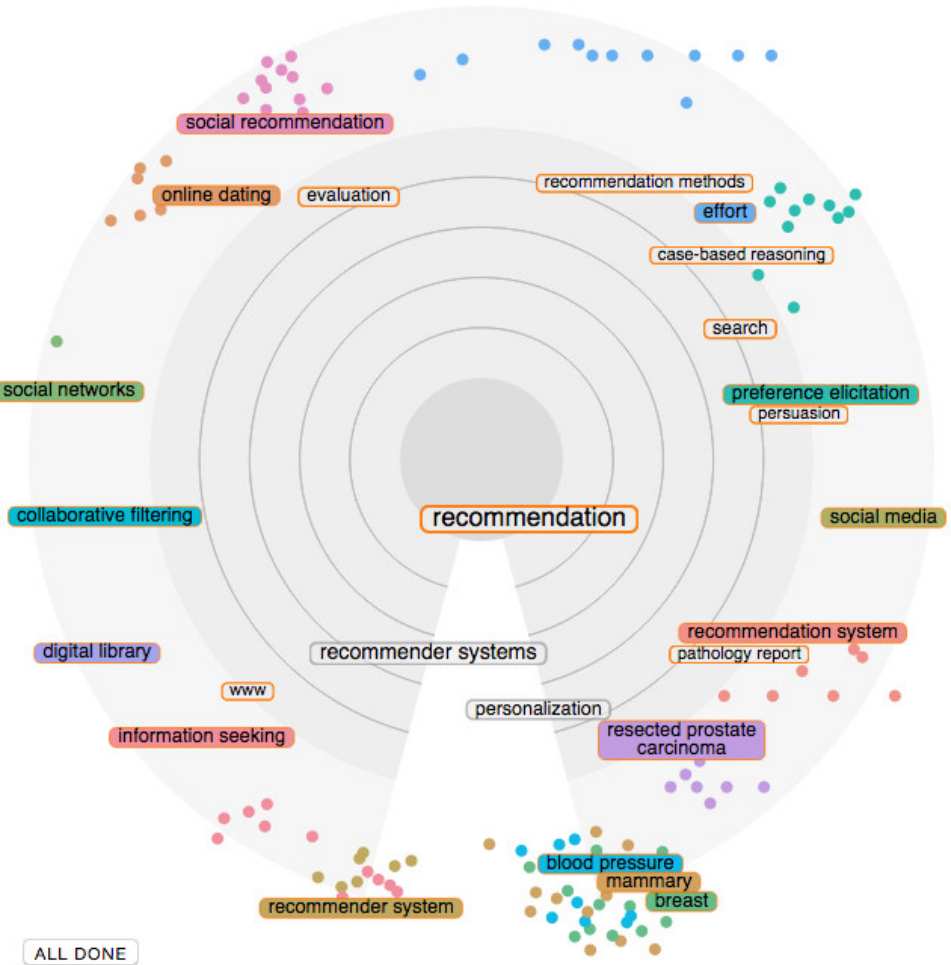
1. the **whole content of the open user model**
2. its **curated subset** (the keywords the user moved in the process of curation).

As a baseline, we also explore transfer of:

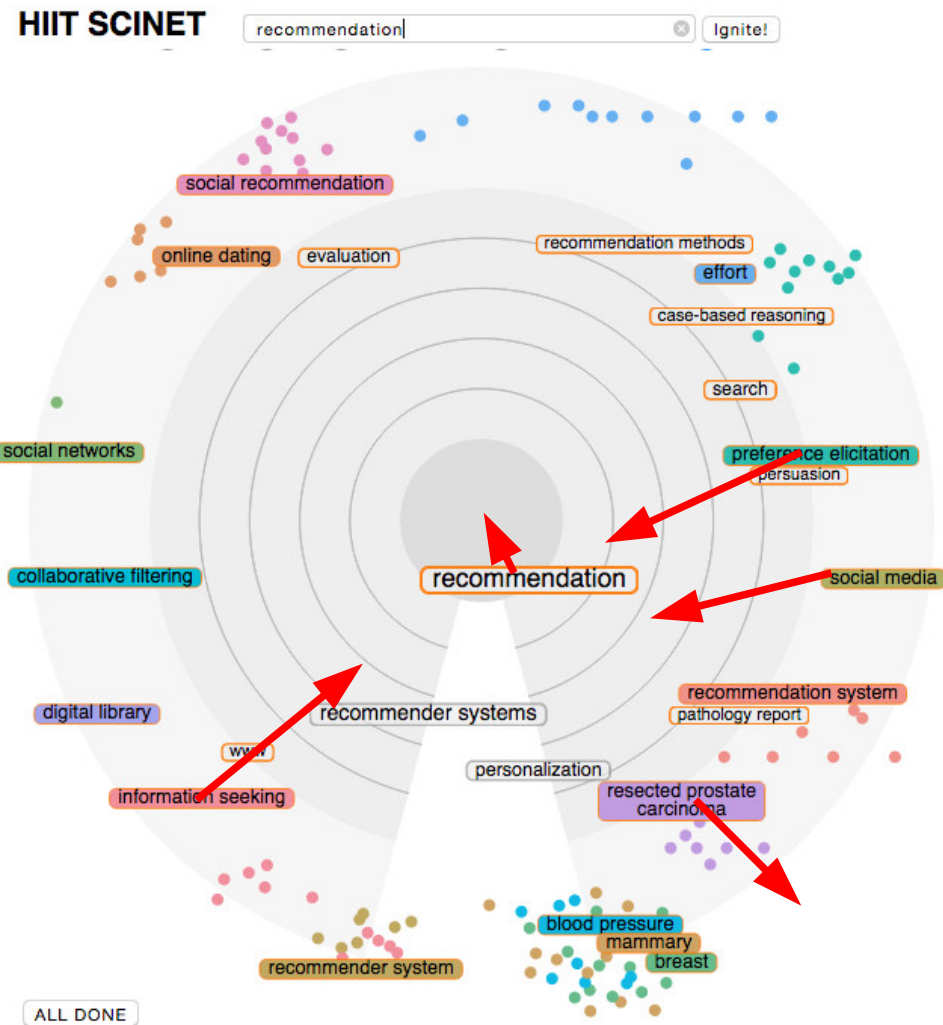
3. the **relevant documents** selected by the user during search (could be considered a hidden, implicit user model)
4. a broader set of all **documents retrieved** in response to user queries (weaker reflection of user interests)

HIIT SCINET

recommendation Ignite!



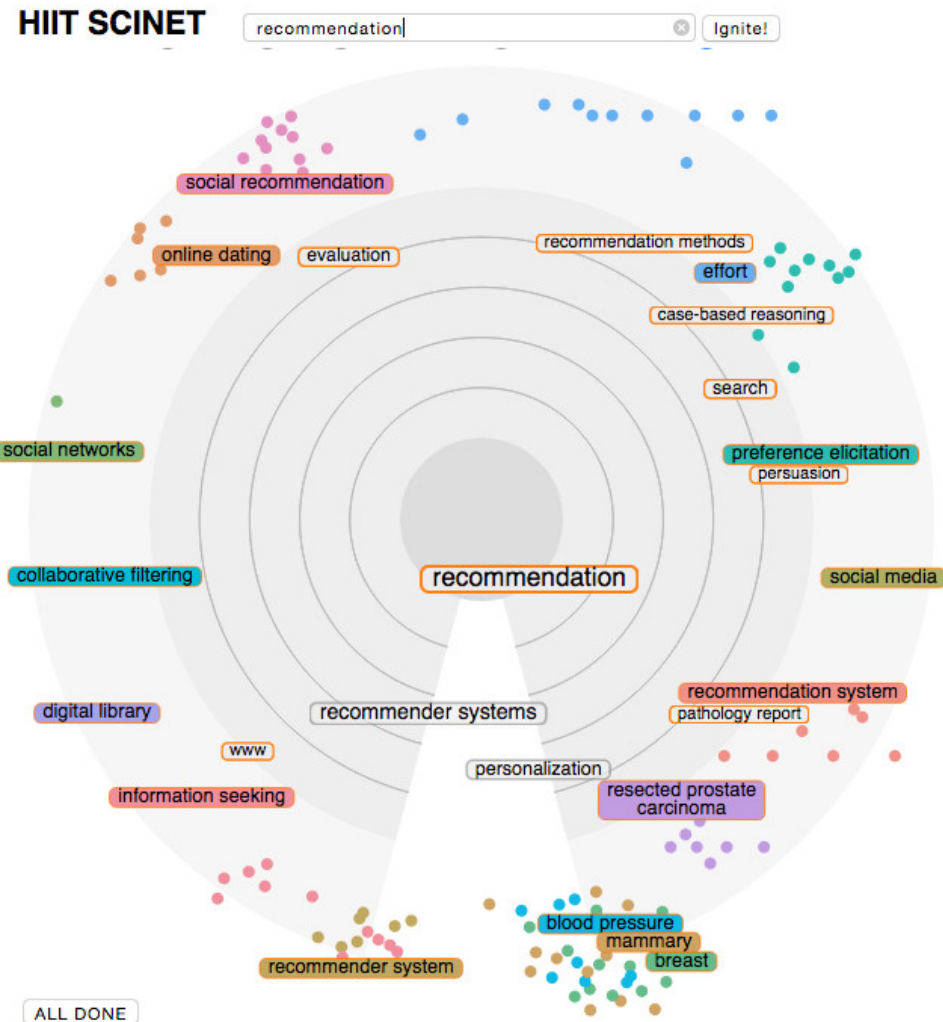
Explicit model 1: manipulated keywords



Take keywords **manipulated** by users, with their **assigned** relevances, convert to unigrams, and form a pseudo-document (bookmarked talk abstract) from them.

(discard unigrams not occurring in target system)

Explicit model 2: shown keywords



At each iteration,
Take keywords
seen by users,
with their **predicted**
relevances, convert to
unigrams, and form a
pseudo-document
(bookmarked talk
abstract) from them.

(discard unigrams not occurring in
target system)

Articles [\[show bookmarked \(0\)\]](#)

new [Recommendations on recommendations](#)

Rolf Molich, Kasper Hornbaek, Josephine Scott (Conference on Human Factors in Computing Systems, 2007-01-01)

[evaluation](#) [usability comment](#) [usability recommendation](#) [usability test problems](#) [usability testing](#)
[user interface](#) [recommendation](#)

This interactive session discusses the q...

new [The Universal Recommender](#)

Jérôme Kunegis, Alan Said, Winfried Umbrath (arXiv.org, 2009-01-01)

[recommender systems](#) [recommendation](#)

We describe the Universal Recommender, a...

new [On recommending](#)

J Furner (JOURNAL OF THE AMERICAN SOCIETY FOR INFORMATION SCIENCE AND TECHNOLOGY, 2002-01-01)

[personalization](#) [information seeking](#) [recommendation](#)

The core of any document retrieval syste...

new [Recommendations for reforming prostatic specimens](#)

V Molinie, A Vieillefond, B Cochand-Priollet, M C Dauge-Geffroy, M A Lefrere-Belda, M De Fromont, A Lesourd, M Toub Blanc, N Berger, R Bouvier, A Villers (ANNALES DE PATHOLOGIE, 1999-01-01)

[prostate cancer](#) [pathological form](#) [recommendation](#) [macroscopic examination](#)
[histological examination](#) [prostate](#) [cancer](#)

The purpose of these recommendations pro...

new [Recommendations for the reporting of breast carcinoma](#)

J L Connolly, R E Fechner, R L Kempson, V A Livolsi, D L Page, A A Patchefsky, S G Silberberg (AMERICAN JOURNAL OF CLINICAL PATHOLOGY, 1995-01-01)

[breast](#) [carcinoma](#) [mammary](#) [recommendation](#)

The purpose of these recommendations is ...

new [Making recommendations better: an analytic model for human-recommender interaction](#)

Sean M. McNee, John Riedl, Joseph A. Konstan (Proceedings of ACM CHI 2006 Conference on Human Factors in Computing Systems, 2006-01-01)

[human-recommender interaction](#) [information seeking](#) [recommender systems](#) [recommendation](#)

Implicit model 1: bookmarked documents

Scientific documents
bookmarked by the user
during the search session
are implicit information
about user interests.

Convert each into
unigrams, add into
CoMeT as a bookmarked
talk.

Articles [\[show bookmarked \(0\)\]](#)

- new** [Recommendations on recommendations](#)
Rolf Molich, Kasper Hornbaek, Josephine Scott (Conference on Human Factors in Computing Systems, 2007-01-01)
evaluation usability comment usability recommendation usability test problems usability testing
user interface recommendation
This interactive session discusses the q...
- new** [The Universal Recommender](#)
Jérôme Kunegis, Alan Said, Winfried Umbrath (arXiv.org, 2009-01-01)
recommender systems recommendation
We describe the Universal Recommender, a...
- new** [On recommending](#)
J Furner (JOURNAL OF THE AMERICAN SOCIETY FOR INFORMATION SCIENCE AND TECHNOLOGY, 2002-01-01)
personalization information seeking recommendation
The core of any document retrieval syste...
- new** [Recommendations for reforming prostatic specimens](#)
V Molinie, A Vieillefond, B Cochand-Priollet, M C Dauge-Geffroy, M A Lefrere-Belda, M De Fromont, A Lesourd, M Toub Blanc, N Berger, R Bouvier, A Villers (ANNALES DE PATHOLOGIE, 1999-01-01)
prostate cancer pathological form recommendation macroscopic examination
histological examination prostate cancer
The purpose of these recommendations pro...
- new** [Recommendations for the reporting of breast carcinoma](#)
J L Connolly, R E Fechner, R L Kempson, V A Livolsi, D L Page, A A Patchefsky, S G Silberberg (AMERICAN JOURNAL OF CLINICAL PATHOLOGY, 1995-01-01)
breast carcinoma mammary recommendation
The purpose of these recommendations is ...
- new** [Making recommendations better: an analytic model for human-recommender interaction](#)
Sean M. McNee, John Riedl, Joseph A. Konstan (Proceedings of ACM CHI 2006 Conference on Human Factors in Computing Systems, 2006-01-01)
human-recommender interaction information seeking recommender systems recommendation

Implicit model 2: seen documents

Scientific documents **seen** by the user during the search session are implicit information about user interests (momentary responses to user search).

Convert each into unigrams, add into CoMeT as a bookmarked talk.

Articles [\[show bookmarked \(0\)\]](#)

- new** [Recommendations on recommendations](#)
Rolf Molich, Kasper Hornbaek, Josephine Scott (Conference on Human Factors in Computing Systems, 2007-01-01)
evaluation usability comment usability recommendation usability test problems usability testing user interface recommendation
This interactive session discusses the q...
- new** [The Universal Recommender](#)
Jérôme Kunegis, Alan Said, Winfried Umbrath (arXiv.org, 2009-01-01)
recommender systems recommendation
We describe the Universal Recommender, a...
- new** [On recommending](#)
J Furner (JOURNAL OF THE AMERICAN SOCIETY FOR INFORMATION SCIENCE AND TECHNOLOGY, 2002-01-01)
personalization information seeking recommendation
The core of any document retrieval syste...
- new** [Recommendations for reforming prostatic specimens](#)
V Molinie, A Vieillefond, B Cochand-Priollet, M C Dauge-Geffroy, M A Lefrere-Belda, M De Fromont, A Lesourd, M Toub Blanc, N Berger, R Bouvier, A Villers (ANNALES DE PATHOLOGIE, 1999-01-01)
prostate cancer pathological form recommendation macroscopic examination histological examination prostate cancer
The purpose of these recommendations pro...
- new** [Recommendations for the reporting of breast carcinoma](#)
J L Connolly, R E Fechner, R L Kempson, V A Livolsi, D L Page, A A Patchefsky, S G Silberberg (AMERICAN JOURNAL OF CLINICAL PATHOLOGY, 1995-01-01)
breast carcinoma mammary recommendation
The purpose of these recommendations is ...
- new** [Making recommendations better: an analytic model for human-recommender interaction](#)
Sean M. McNee, John Riedl, Joseph A. Konstan (Proceedings of ACM CHI 2006 Conference on Human Factors in Computing Systems, 2006-01-01)
human-recommender interaction information seeking recommender systems recommendation

Experiments

- **20 researchers from University of Helsinki:**
14 male, 6 female; 10 PhD researchers and 10 research assistants
- **SciNet: Search relevant papers to their interest**
 - “Write down 3 areas of your research interests. Imagine you are preparing for a course/seminar for each interest. Search scientific documents you find useful for preparing for the courses/seminars.”
 - Bookmark at least 5 documents for each interest.
 - 7min demonstration, 30min for task
 - Complex enough: users must interact with the system to get needed information. Broad enough to reveal research interests.
- **CoMeT: Rate 500 talks (Jan 1 to May 17, 2013)**
 - Consider attending (Yes/No)? If yes, rate willingness 1 – 5
 - 7min demonstration, 75min for task
- **All interactions logged** (shown/manipulated keywords shown/bookmarked documents, queries, read abstracts...)

Non-cold-start Setting

- We first evaluated a traditional non-cold-start learning setting
- 10-fold cross-validation setup, in each fold rank the held-out CoMeT talks by 3 predictors
- **Centroid:** rank test talks by cosine similarity to centroid of bookmarked talks
- **k-Nearest-Neighbor:** find nearest training neighbors for each test talk, rank by $S_{\text{pos}} - S_{\text{neg}}$ (sum of cosine similarities to positive nearest neighbors - sum of cosine similarities to negative neighbors)
- **positive-only kNN:** find nearest positive-rated talks, rank by sum of cosine similarity to them

Non-cold-start Setting

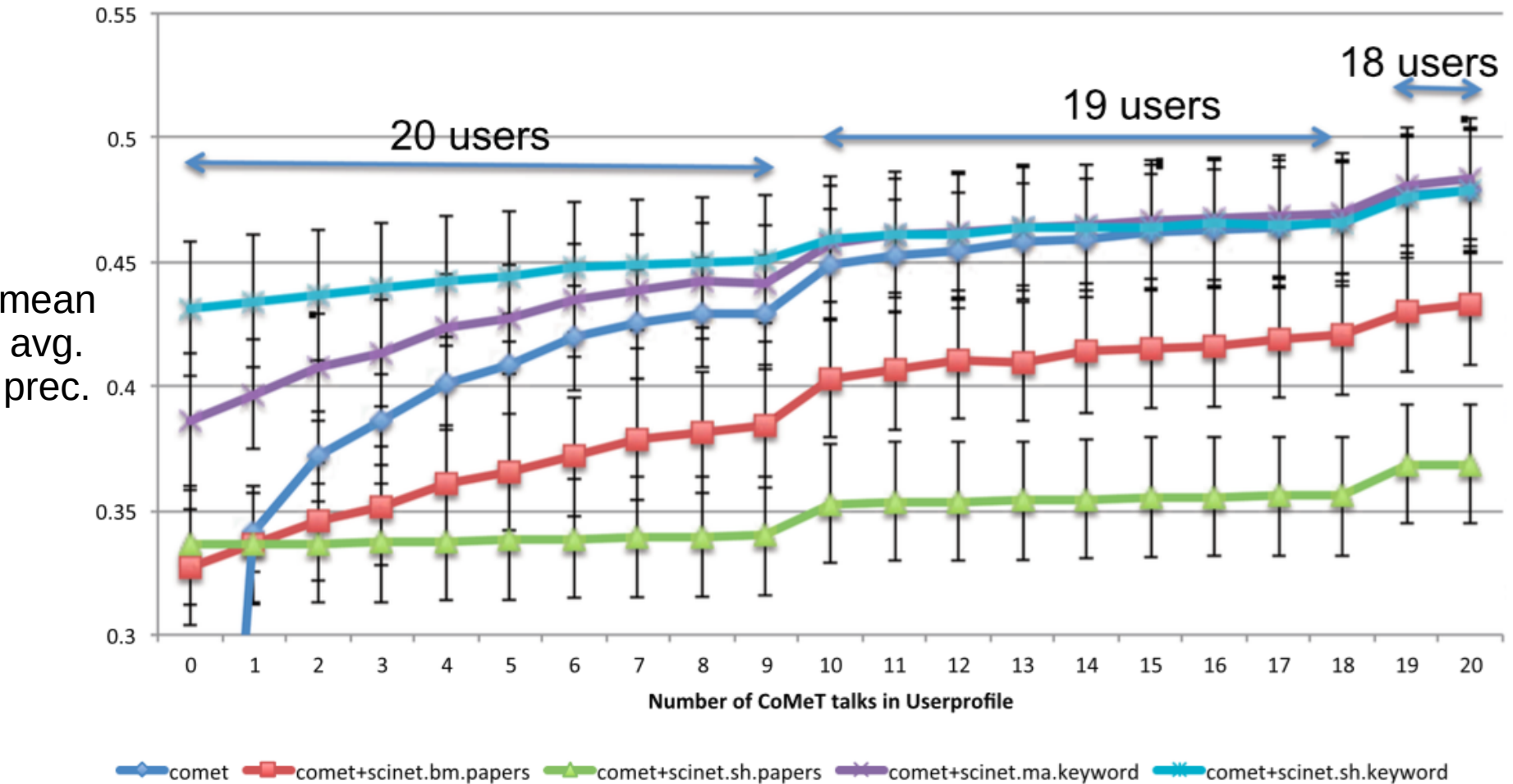
- Results evaluated by Mean Average Precision of ranked test talks
(mean of precision values at positive test talks in the ranking, averaged over users and folds)
- no significant improvement from transfer compared to baseline in non-cold-start setting from traditional or open-user-model approach
- User profiles in CoMeT had enough data to work well on their own

Mean Average Precision		Centroid	k-NN				k-NN.PO			
			5nn	10nn	20nn	30nn	5nn.po	10nn.po	20nn.po	30nn.po
baseline		0.47	0.45	0.47	0.48	0.46	0.48	0.50	0.50	0.50
Implicit User Model	ex.papers	0.42	0.44	0.45	0.45	0.44	0.43	0.44	0.44	0.44
	im.papers	0.36	0.36	0.36	0.35	0.35	0.36	0.37	0.36	0.36
Explicit Open User Model	ex.keywords	0.48	0.46	0.48	0.48	0.47	0.49	0.51	0.51	0.50
	im.keywords	0.47	0.46	0.48	0.49	0.49	0.48	0.49	0.49	0.48

Cold-start Setting

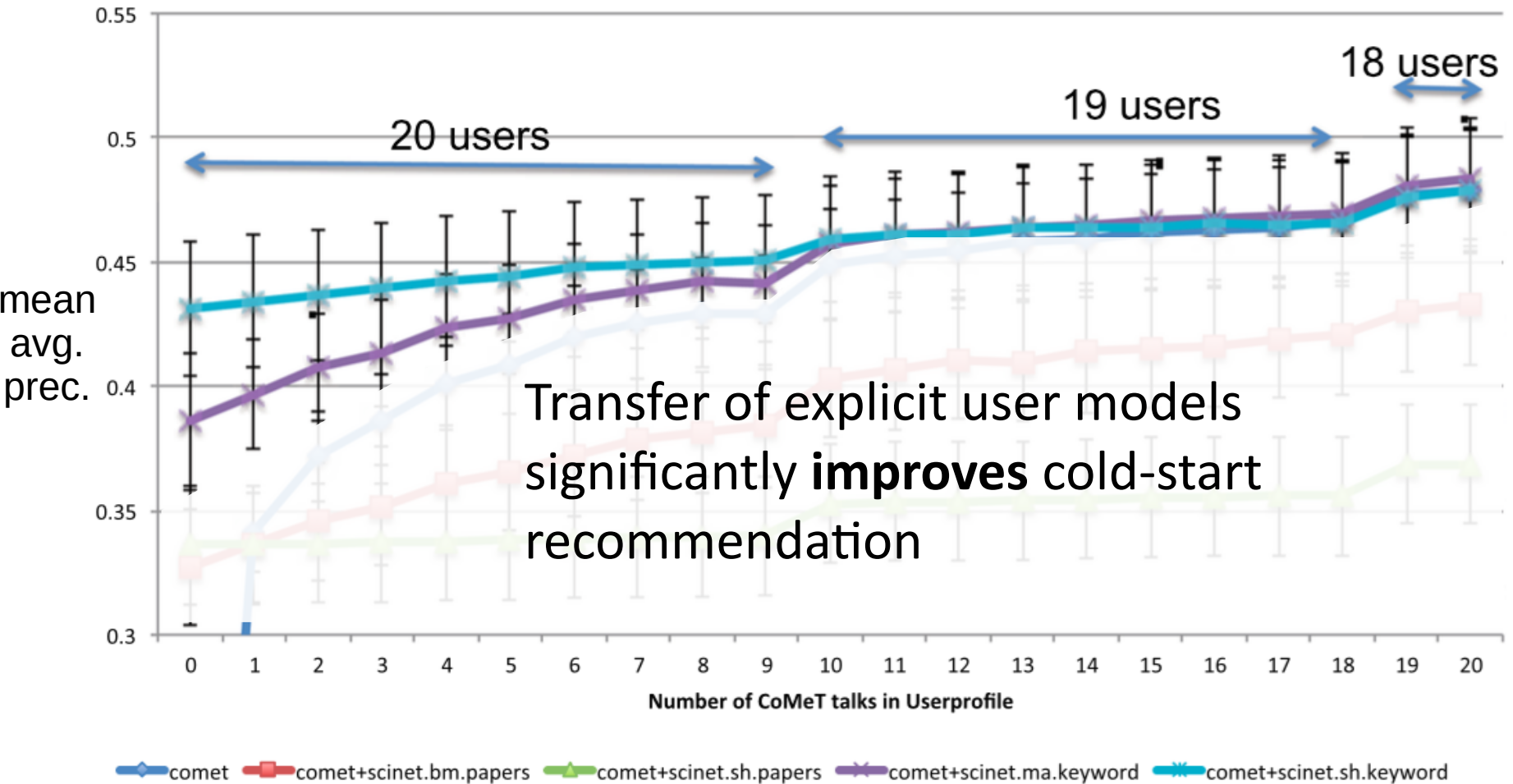
- In each cross-validation fold we subsample a small pool of cold-start talks (0-20 positive talks, proportionally same amount of negative talks)
- Cold-start talks used to predict test talk ranking, evaluate by mean average precision
- We report average results over 10 subsamplings
- Same predictors as before (Centroid, k-Nearest-Neighbor, positive-only kNN)

Cold-Start Impact



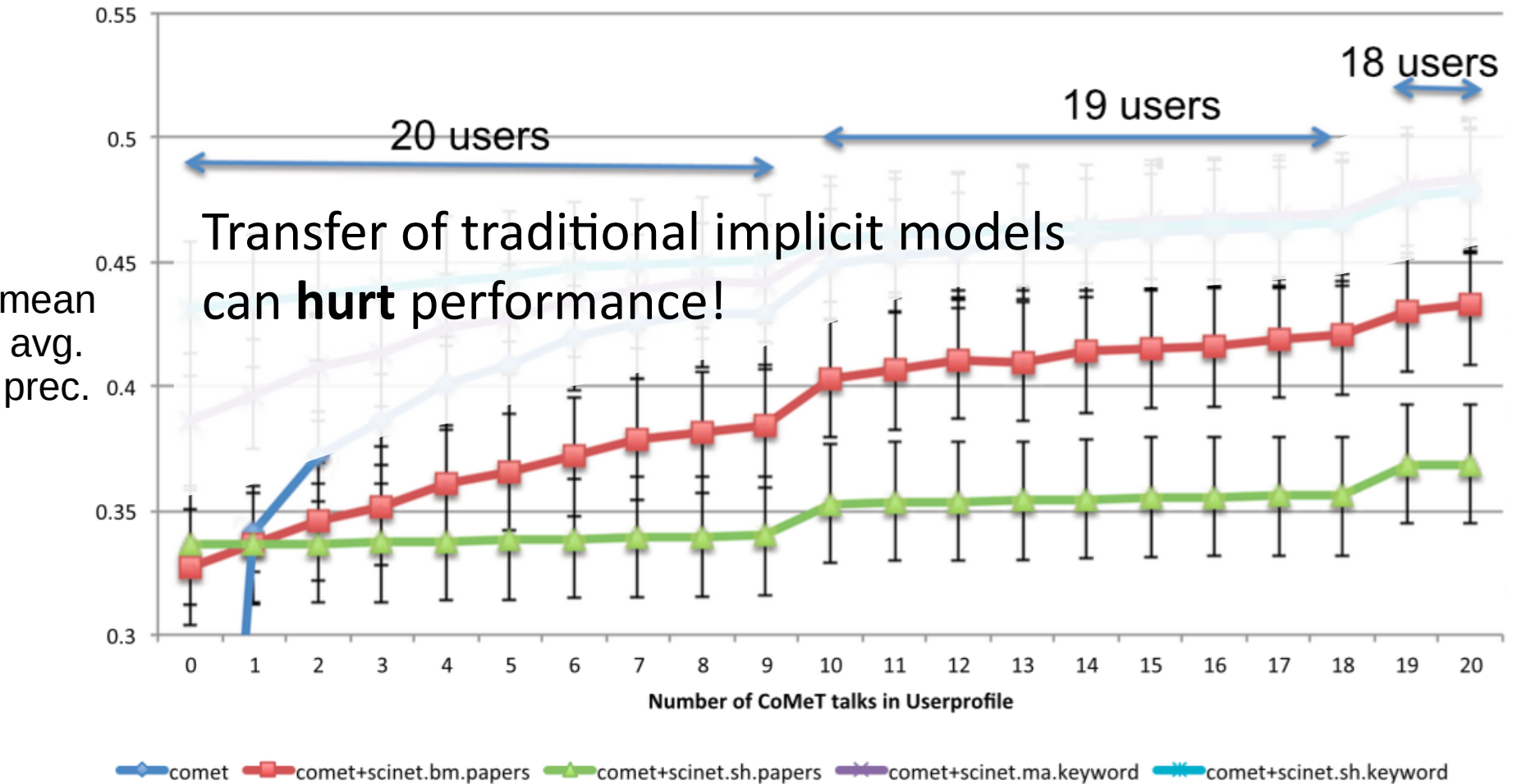
Results with centroid predictor shown: positive-only kNN performs essentially the same, and outperforms kNN

Cold-Start Impact



Results with centroid predictor shown: positive-only kNN performs essentially the same, and outperforms kNN

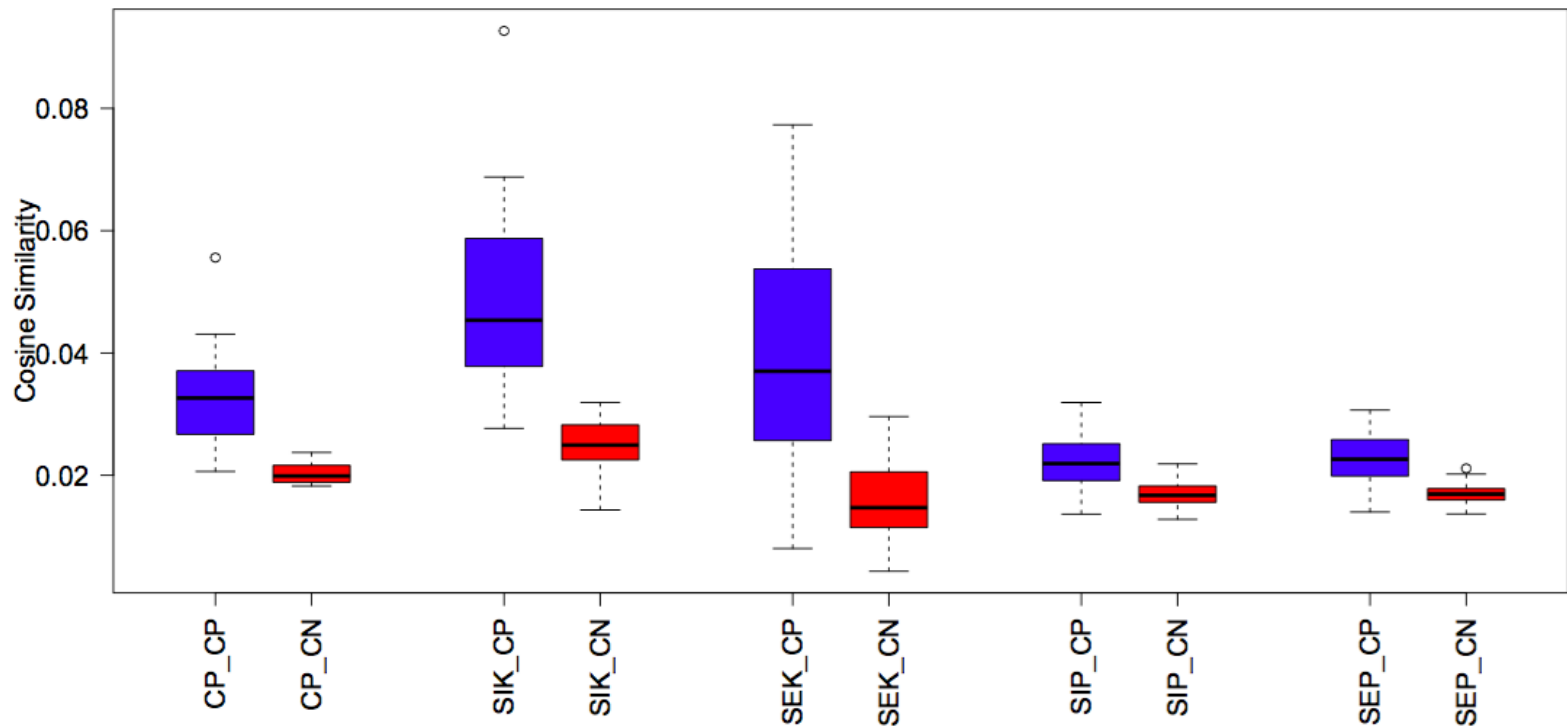
Cold-Start Impact



Results with centroid predictor shown: positive-only kNN performs essentially the same, and outperforms kNN

Analysis

- Cosine similarities between different information types



Explicit open user models have good similarity to **positive-rated talks**, well separated from **uninteresting talks**

Implicit models from papers are far from bookmarked talks. They do not separate positive-rated from uninteresting talks. → add more noise than value

Summary

- Cross-system personalization by transferring an **explicit, open, and editable user model**.
- Transfer from a literature search system to a talk recommendation system.
- Cross-system model transfer is challenging: no impact in general case
- However, **significant impact in cold-start case!**
- **Use of open, explicitly curated user models is critical** for the success of user model transfer
- Transferring implicit models (here through shown or bookmarked documents) can damage performance

