

How to read a Paper

ISMLL

Dr. Josif Grabocka

Outline

How to read a paper

Common paper structure

Finding additional material

Seminar - Adversarial Machine Learning



How to read a paper

- ▶ Like novel or newspaper stories, scientific articles needs to be read differently.
- ▶ Since they are not books designed for students sometimes they are not self contained and requires some research to be fully understood.
- ▶ Understand a paper for a researcher means to be able to implement the described algorithm.

Seminar - Adversarial Machine Learning

How to read a paper

- ▶ Skim
- ▶ Re-read
- ▶ Analyze
- ▶ Summarize

Seminar - Adversarial Machine Learning

Skim

First get the "Big picture" by reading the title, abstract, and introduction carefully: this will tell you the major findings and why they matter.

- ▶ Quickly scan the article without taking notes: focus on headings and subheadings
- ▶ Note the publishing date and conference/journal
- ▶ Note terms and parts you don't understand.
Only with the bigger picture you will understand how much it is necessary to investigate something.

Seminar - Adversarial Machine Learning

Re-read

Read the article again, asking yourself questions such as:

- ▶ What problems is the study trying to solve?
- ▶ Are findings well supported by evidence?
- ▶ Is the study repeatable? (i.e. is the article self contained?)
- ▶ If you do not understand take some time to find a brief explanation of what you are not understanding (one-two sentences).
- ▶ Is the paper innovative?

Seminar - Adversarial Machine Learning

Interpret

- ▶ Examine graphs and tables carefully
- ▶ Try to interpret data first before looking at captions
- ▶ When reading the discussion and results look after key issues and new findings
- ▶ Make sure you have distinguished the main points. If not go over the text again.

Seminar - Adversarial Machine Learning



Summarize

- ▶ Take notes and underline key points: it improves reading
- ▶ Decide what part of the paper needs to be expanded and how much.

Seminar - Adversarial Machine Learning

Common paper structure

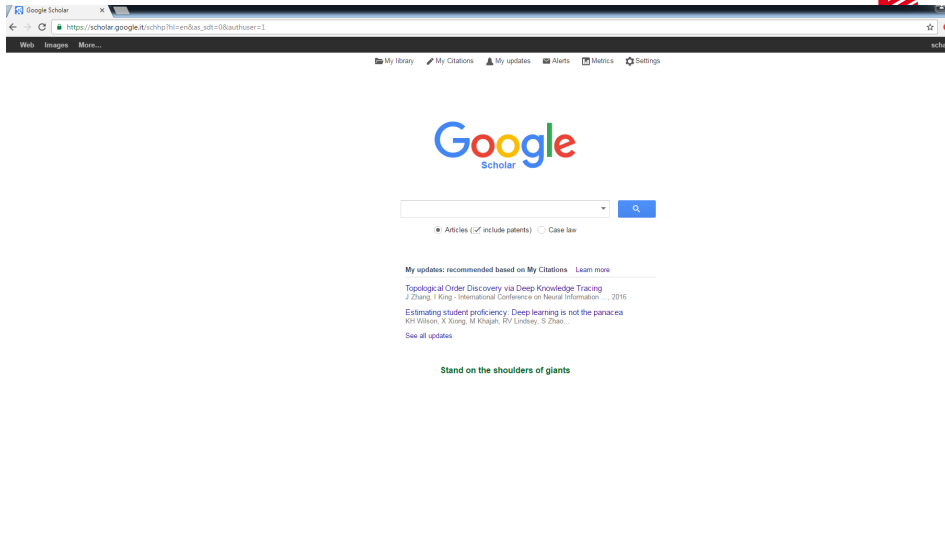
- ▶ Abstract
- ▶ Introduction
- ▶ State of the art
- ▶ Algorithms explanation
- ▶ Experiments
- ▶ Conclusions and future work
- ▶ References

Seminar - Adversarial Machine Learning

Let's take this paper as an example:

"Huang, S., Wang, S., Liu, T. Y., Ma, J., Chen, Z., and Veijalainen, J. (2015, August). **Listwise Collaborative Filtering**. In Proceedings of the 38th International ACM SIGIR Conference on Research and Development in Information Retrieval (pp. 343-352). ACM."

Go to: www.scholar.google.com/



The screenshot shows the Google Scholar homepage in a browser window. The address bar contains the URL `https://scholar.google.it/schhp?hl=en&as_sdt=0&authuser=1`. The navigation bar includes links for My library, My Citations, My updates, Alerts, Metrics, and Settings. The main content area features the Google Scholar logo, a search input field, and a search button. Below the search field, there are radio buttons for 'Articles (checked)', 'include patents', and 'Case law'. A section titled 'My updates: recommended based on My Citations' lists two articles: 'Topological Order Discovery via Deep Knowledge Tracing' by J Zhang, I King (2016) and 'Estimating student proficiency: Deep learning is not the panacea' by KH Wilson, X Xiong, M Khajeh, RV Lindsey, S Zhao. At the bottom right, there are links for 'About Google Scholar', 'Privacy', 'Terms', and 'Go to Google Scholar'.

Listwise Collaborative Filtering

https://scholar.google.it/scholar?hl=en&authuser=1&q=Listwise+Collaborative+Filtering&btnG=&as_sdt=1%2C5&as_sdtpr=

Web Images More...

Google Listwise Collaborative Filtering

Scholar About 1,280 results (0.09 sec)

Articles

Case law

My library

Any time

Since 2016

Since 2015

Since 2012

Custom range...

Sort by relevance

Sort by date

include patents

include citations

Create alert

Listwise Collaborative Filtering [PDF] researchgate.net
 S Huang, S Wang, TY Liu, J Ma, Z Chen... - Proceedings of the 38th ..., 2015 - dl.acm.org
 Abstract Recently, ranking-oriented collaborative filtering (CF) algorithms have achieved great success in recommender systems. They obtained state-of-the-art performances by estimating a preference ranking of items for each user rather than estimating the absolute ...
 Cited by 2 Related articles All 6 versions Cite Save More

List-wise learning to rank with matrix factorization for collaborative filtering [PDF] tudelft.nl
 Y Shi, M Larson, A Hanjalic - Proceedings of the fourth ACM conference ..., 2010 - dl.acm.org
 Abstract A ranking approach, ListRank-MF, is proposed for **collaborative filtering** that combines a **list-wise** learning-to-rank algorithm with matrix factorization (MF). A ranked list of items is obtained by minimizing a loss function that represents the uncertainty between ...
 Cited by 99 Related articles All 16 versions Cite Save More

Learning to rank: from pairwise approach to listwise approach [PDF] wustl.edu
 Z Cao, T Qin, TY Liu, MF Tsai, H Li - Proceedings of the 24th international ..., 2007 - dl.acm.org
 ... These include document retrieval, **collaborative filtering**, expert finding, anti web spam, sentiment analysis, and product ... metric between the corresponding top k probability distributions as the **list-wise** loss function ... when we use Cross Entropy as metric, the **listwise** loss function ...
 Cited by 901 Related articles All 26 versions Cite Save More

Probabilistic latent preference analysis for collaborative filtering [PDF] cuhk.edu.hk
 NN Liu, M Zhao, Q Yang - Proceedings of the 18th ACM conference on ..., 2009 - dl.acm.org
 ... To recommend new items to a user, content-based **filters** match their representations to those items the user has expressed interests on. In contrast, the **collaborative filtering**(CF) approach does not require any content information about the items, it works by collecting ratings ...
 Cited by 78 Related articles All 5 versions Cite Save More

Effort estimation based on collaborative filtering [PDF] toyo.ac.jp
 N Ohsugi, M Tsunoda, A Monden... - Conference on Product ..., 2004 - Springer
 ... Their results showed that **listwise** deletion technique did not performed well when the level of missing data was more than 30 ... In this paper, we propose **Collaborative Filtering** (CF) based effort estimation method, under the assumption that the (historical) predictor data have a ...

Seminar - Adversarial Machine Learning

Abstract

- ▶ Brief introduction to the topic
- ▶ Brief introduction to paper achievements
- ▶ Brief summary of the experiments

Seminar - Adversarial Machine Learning

Introduction

- ▶ Introduction to the topic
- ▶ Introduction of the main concepts
- ▶ Introduction of the main state of the art methods
- ▶ **State of the art limitations**
- ▶ **Hypotheses**
- ▶ **Contributions**

Seminar - Adversarial Machine Learning

The Importance of Hypotheses

- ▶ It is not enough to describe some new technique or system, some claim about it must be stated and evaluated
- ▶ In experimental research, hypotheses typically take one of these two forms:
 - ▶ Technique/system X automates task Y for the first time
 - ▶ Technique/system X automates task Y better, along some dimension, than each of its rivals
- ▶ In theoretical papers, the hypotheses are the statements of theorems and the supporting evidence is their proofs

Seminar - Adversarial Machine Learning

The Importance of Hypotheses

Technique/system X automates task Y better, along some dimension, than each of its rivals, where the dimensions are typically:

- ▶ **Behavior:** X has a higher success rate or produces better quality outputs than Y
- ▶ **Coverage:** X is applicable to a wider range of examples than Y
- ▶ **Efficiency:** X is faster or uses less space than Y
- ▶ **Dependability:** X is more reliable, safe or secure than its rivals
- ▶ **Maintainability:** X is easier to adapt and extend than its rivals
- ▶ **Usability:** Users find X easier to use than its rivals

Seminar - Adversarial Machine Learning

State of the art / Related work

- ▶ Is a broad and shallow account of the field, which helps to place the contribution of the paper in context
- ▶ What are the rival approaches?
- ▶ What are the drawbacks of each?
 - ▶ One sentence per method. Is it clear enough?
- ▶ How has the battle between different approaches progressed?
- ▶ What are the major outstanding problems?

Seminar - Adversarial Machine Learning



Algorithm Explanation

- ▶ First the authors introduce the algorithm from which they derived the new algorithm
- ▶ Then, the new algorithm is explained
- ▶ Contains:
 - ▶ Formulas
 - ▶ Pseudo code

Algorithm 1: The ListCF Algorithm

Input: An item set I , a user set U , and a rating matrix $R \in \mathbb{R}^{M \times N}$. A set of rated items $I_u \subseteq I$ by each user $u \in U$. The maximal number of iterations $maxIteration$ and error threshold ϵ .

Output: A ranking \hat{r}_u of items for each user $u \in U$.

```

1 for  $u \in U$  do
2   for  $v \in U$  and  $u \neq v$  do
3      $P_u, P_v \leftarrow \text{TopKProDist}(I_u, I_v, R)$  /* Eq.1 */
4      $sim(u, v) \leftarrow \text{Similarity}(P_u, P_v)$  /* Eq.2 */
5   end
6    $N_u \leftarrow \text{SelectNeighbors}(\{sim(u, v)\}_{v \in U/u})$ 
7 end
8 for  $u \in U$  do
9    $t = 1$ 
10  repeat
11     $\epsilon = 0$ 
12    Initialize( $\varphi_u^0$ )
13    for  $g \in \mathcal{G}_k^{T_u}$  do
14       $\varphi_{u,g}^t \leftarrow \text{Update}(N_u, sim, R)$  /* Eq.8 */
15       $\epsilon += \sqrt{\sum (\varphi_{u,g}^t - \varphi_{u,g}^{t-1})^2}$ 
16    end
17     $t \leftarrow t + 1$ 
18  until  $t > maxIteration$  or  $\epsilon < \epsilon$ ;
19  for  $t \in T_u$  do
20     $P(t) \leftarrow \text{Aggregation}(\{\varphi_{u,g}\}_{g \in \mathcal{G}_k^{T_u}})$ 
21  end
22   $\hat{r}_u \leftarrow \text{Ordering}(\{P(t)\}_{t \in T_u})$ 
23 end

```

Seminar - Adversarial Machine Learning

Experiments

▶ Dataset Explanation

- ▶ What are the available information?
- ▶ What are the available statistics? E.g. number of users, items, sparsity etc.

▶ Evaluation protocol

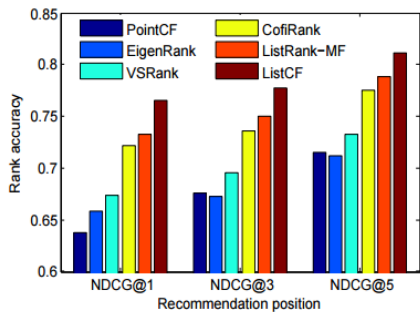
- ▶ How is the error of the algorithm computed?
- ▶ Are there any other quantitative success measures?

▶ Experiments

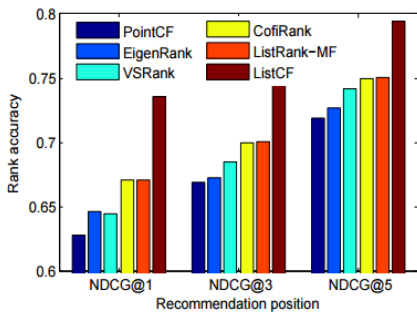
- ▶ Are the results statistically significant?

Table 2: Statistics on the three datasets.

	Movielens-1M	EachMovie	Netflix
#users	6,040	36,656	429,584
#items	3,952	1,623	17,770
#ratings	1,000,209	2,580,222	99,884,940
#ratings/user	165.6	70.4	232.5
#ratings/item	253.1	1589.8	5621.0
sparsity	93.7%	95.7%	98.7%



(a) Movielens-1M



(b) EachMovie

Seminar - Adversarial Machine Learning

Conclusions

- ▶ Repeats the contributions pointing out specifically how the paper addressed it
- ▶ Include future works

Seminar - Adversarial Machine Learning

Finding additional material

- ▶ If you don't understand something..
- ▶ This is not a book, it happens...
 - ▶ Try to pose yourself a specific questions
 - ▶ Look online

Seminar - Adversarial Machine Learning



Finding additional material

- ▶ A book explaining the algorithms
- ▶ A PhD thesis
- ▶ Tutorials
- ▶ Highly related state of the art papers

Listwise Collaborative Filtering

https://scholar.google.it/scholar?hl=en&authuser=1&q=Listwise+Collaborative+Filtering&btnG=&as_sdt=1%2C5&as_sdp=

Web Images More...

Google Listwise Collaborative Filtering

Scholar About 1,280 results (0.09 sec)

Articles

Case law

My library

Any time

Since 2016

Since 2015

Since 2012

Custom range...

Sort by relevance

Sort by date

include patents

include citations

Create alert

Listwise Collaborative Filtering [PDF] researchgate.net
 S Huang, S Wang, TY Liu, J Ma, Z Chen... - Proceedings of the 38th ..., 2015 - dl.acm.org
 Abstract Recently, ranking-oriented collaborative filtering (CF) algorithms have achieved great success in recommender systems. They obtained state-of-the-art performances by estimating a preference ranking of items for each user rather than estimating the absolute ...
 Cited by 2 Related articles All 6 versions Cite Save More

List-wise learning to rank with matrix factorization for collaborative filtering [PDF] tudelft.nl
 Y Shi, M Larson, A Hanjalic - Proceedings of the fourth ACM conference ..., 2010 - dl.acm.org
 Abstract A ranking approach, ListRank-MF, is proposed for **collaborative filtering** that combines a **list-wise** learning-to-rank algorithm with matrix factorization (MF). A ranked list of items is obtained by minimizing a loss function that represents the uncertainty between ...
 Cited by 99 Related articles All 16 versions Cite Save More

Learning to rank: from pairwise approach to listwise approach [PDF] wustl.edu
 Z Cao, T Qin, TY Liu, MF Tsai, H Li - Proceedings of the 24th international ..., 2007 - dl.acm.org
 ... These include document retrieval, **collaborative filtering**, expert finding, anti web spam, sentiment analysis, and product ... metric between the corresponding top k probability distributions as the **list-wise** loss function ... when we use Cross Entropy as metric, the **listwise** loss function ...
 Cited by 901 Related articles All 26 versions Cite Save More

Probabilistic latent preference analysis for collaborative filtering [PDF] cuhk.edu.hk
 NN Liu, M Zhao, Q Yang - Proceedings of the 18th ACM conference on ..., 2009 - dl.acm.org
 ... To recommend new items to a user, content-based **filters** match their representations to those items the user has expressed interests on. In contrast, the **collaborative filtering**(CF) approach does not require any content information about the items, it works by collecting ratings ...
 Cited by 78 Related articles All 5 versions Cite Save More

Effort estimation based on collaborative filtering [PDF] toyo.ac.jp
 N Ohsugi, M Tsunoda, A Monden... - ... Conference on Product ..., 2004 - Springer
 ... Their results showed that **listwise** deletion technique did not performed well when the level of missing data was more than 30 ... In this paper, we propose **Collaborative Filtering** (CF) based effort estimation method, under the assumption that the (historical) predictor data have a ...



Sheng-Lung Huang

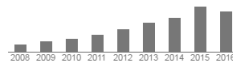
National Taiwan University
Biomedical imaging, fiber, laser, crystal
Verified email at ntu.edu.tw

Follow

Google Scholar

Get my own profile

Citation indices	All	Since 2011
Citations	15313	10955
h-index	49	39
i10-index	408	298



Title	1-20	Cited by	Year
Strain engineering and one-dimensional organization of metal-insulator domains in single-crystal vanadium dioxide beams		266	2009
J Cao, E Ertekin, V Srinivasan, W Fan, S Huang, H Zheng, JW Lim, ... Nature nanotechnology 4 (11), 732-737			
Contrasting patterns of retinoblastoma protein expression in mouse embryonic stem cells and embryonic fibroblasts.		248	1994
P Savatier, S Huang, L Szekeley, KG Wiman, J Samarut Oncogene 9 (3), 809-818			
Flooding-induced membrane damage, lipid oxidation and activated oxygen generation in corn leaves		227	1996
B Yan, Q Dai, X Liu, S Huang, Z Wang Plant and soil 179 (2), 261-268			

Listwise Collaborative Filtering

https://scholar.google.it/scholar?hl=en&authuser=1&q=Listwise+Collaborative+Filtering&btnG=&as_sdt=1%2C5&as_sdtp=

Web Images More...

Google

Listwise Collaborative Filtering

Scholar

About 1,280 results (0.09 sec)

Articles

Case law

My library

Any time

Since 2016

Since 2015

Since 2012

Custom range...

Sort by relevance

Sort by date

 include patents include citations Create alert**Listwise Collaborative Filtering**

[S Huang](#), [S Wang](#), [TY Liu](#), [J Ma](#), [Z Chen](#)... - Proceedings of the 38th ..., 2015 - dl.acm.org
Abstract Recently, ranking-oriented collaborative filtering (CF) algorithms have achieved great success in recommender systems. They obtained state-of-the-art performances by estimating a preference ranking of items for each user rather than estimating the absolute ...
Cited by 2 Related articles All 6 versions Cite Save More

[\[PDF\] researchgate.net](#)**List-wise learning to rank with matrix factorization for collaborative filtering**

[Y Shi](#), [M Larson](#), [A Hanjalic](#) - Proceedings of the fourth ACM conference ..., 2010 - dl.acm.org
Abstract A ranking approach, ListRank-MF, is proposed for **collaborative filtering** that combines a **list-wise** learning-to-rank algorithm with matrix factorization (MF). A ranked list of items is obtained by minimizing a loss function that represents the uncertainty between ...
Cited by 99 Related articles All 16 versions Cite Save More

[\[PDF\] tudelft.nl](#)**Learning to rank: from pairwise approach to listwise approach**

[Z Cao](#), [T Qin](#), [TY Liu](#), [MF Tsai](#), [H Li](#) - Proceedings of the 24th international ..., 2007 - dl.acm.org
... These include document retrieval, **collaborative filtering**, expert finding, anti web spam, sentiment analysis, and product ... metric between the corresponding top k probability distributions as the **list-wise** loss function ... when we use Cross Entropy as metric, the **listwise** loss function ...
Cited by 901 Related articles All 26 versions Cite Save More

[\[PDF\] wustl.edu](#)**Probabilistic latent preference analysis for collaborative filtering**

[NN Liu](#), [M Zhao](#), [Q Yang](#) - Proceedings of the 18th ACM conference on ..., 2009 - dl.acm.org
... To recommend new items to a user, content-based **filters** match their representations to those items the user has expressed interests on. In contrast, the **collaborative filtering**(CF) approach does not require any content information about the items, it works by collecting ratings ...
Cited by 78 Related articles All 5 versions Cite Save More

[\[PDF\] cuhk.edu.hk](#)**Effort estimation based on collaborative filtering**

[N Ohsugi](#), [M Tsunoda](#), [A Monden](#)... - Conference on Product ..., 2004 - Springer
... Their results showed that **listwise** deletion technique did not performed well when the level of missing data was more than 30 ... In this paper, we propose **Collaborative Filtering** (CF) based effort estimation method, under the assumption that the (historical) predictor data have a ...

[\[PDF\] toyo.ac.jp](#)

Listwise Collaborative Filtering

https://scholar.google.it/scholar?hl=en&authuser=1&q=Listwise+Collaborative+Filtering&btnG=&as_sdt=1%2C5&as_sdtp=

Web Images More...

Google

Listwise Collaborative Filtering

Scholar

About 1,280 results (0.09 sec)

Articles

Listwise Collaborative Filtering[\[PDF\] researchgate.net](#)

Case law

[S Huang](#), [S Wang](#), [TY Liu](#), [J Ma](#), [Z Chen](#)... - Proceedings of the 38th ..., 2015 - dl.acm.org

My library

Abstract Recently, ranking-oriented collaborative filtering (CF) algorithms have achieved great success in recommender systems. They obtained state-of-the-art performances by estimating a preference ranking of items for each user rather than estimating the absolute ...

Cited by 2 Related articles All 6 versions Cite Save More

Any time

List-wise learning to rank with matrix factorization for collaborative filtering[\[PDF\] tudelft.nl](#)

Since 2016

[Y Shi](#), [M Larson](#), [A Hanjalic](#) - Proceedings of the fourth ACM conference ..., 2010 - dl.acm.org

Since 2015

Abstract A ranking approach, ListRank-MF, is proposed for **collaborative filtering** that combines a **list-wise** learning-to-rank algorithm with matrix factorization (MF). A ranked list of items is obtained by minimizing a loss function that represents the uncertainty between ...

Since 2012

Cited by 99 Related articles All 16 versions Cite Save More

Custom range...

Sort by relevance

Learning to rank: from pairwise approach to listwise approach[\[PDF\] wustl.edu](#)

Sort by date

[Z Cao](#), [T Qin](#), [TY Liu](#), [MF Tsai](#), [H Li](#) - Proceedings of the 24th international ..., 2007 - dl.acm.org

... These include document retrieval, **collaborative filtering**, expert finding, anti web spam, sentiment analysis, and product ... metric between the corresponding top k probability distributions as the **list-wise** loss function ... when we use Cross Entropy as metric, the **listwise** loss function ...

Cited by 901 Related articles All 26 versions Cite Save More

 include patents include citations Create alert**Probabilistic latent preference analysis for collaborative filtering**[\[PDF\] cuhk.edu.hk](#)

[NN Liu](#), [M Zhao](#), [Q Yang](#) - Proceedings of the 18th ACM conference on ..., 2009 - dl.acm.org

... To recommend new items to a user, content-based **filters** match their representations to those items the user has expressed interests on. In contrast, the **collaborative filtering**(CF) approach does not require any content information about the items, it works by collecting ratings ...

Cited by 78 Related articles All 5 versions Cite Save More

Effort estimation based on collaborative filtering[\[PDF\] toyo.ac.jp](#)

[N Ohsugi](#), [M Tsunoda](#), [A Monden](#)... - ... Conference on Product ..., 2004 - Springer

... Their results showed that **listwise** deletion technique did not performed well when the level of missing data was more than 30 ... In this paper, we propose **Collaborative Filtering** (CF) based effort estimation method, under the assumption that the (historical) predictor data have a ...

Google Scholar

Listwise Collaborative Filtering

About 1,270 results (0.07 sec)

Articles

Listwise Collaborative Filtering
[S. Huang](#), [S. Wang](#), [TY Liu](#), [J. Ma](#), [Z. Chen](#), [J. Veijalainen](#) - Proceedings of the 38th International ACM SIGIR Conference on Research and Development in Information Retrieval, ACM, 2015. Cited by 2 Related articles All 6 v

Case law

My library

Any time

Since 2016

Since 2015

Since 2012

Custom range...

Sort by relevance

Sort by date

include patents

include citations

Create alert

List-wise learning to rank with listwise loss
[Y. Shi](#), [M. Larson](#), [A. Hanjalic](#) - Proceedings of the 38th International ACM SIGIR Conference on Research and Development in Information Retrieval, ACM, 2015. Cited by 98 Related articles All 16 v

Learning to rank: from pairwise comparisons to listwise loss
[Z. Cao](#), [T. Qin](#), [TY Liu](#), [MF Tsai](#), [H. Li](#) - Proceedings of the 38th International ACM SIGIR Conference on Research and Development in Information Retrieval, ACM, 2015. Cited by 900 Related articles All 2 v

Probabilistic latent preference models
[NN Liu](#), [M. Zhao](#), [Q. Yang](#) - Proceedings of the 38th International ACM SIGIR Conference on Research and Development in Information Retrieval, ACM, 2015. Cited by 78 Related articles All 5 v

Effort estimation based on collaborative filtering
[N. Ohsugi](#), [M. Tsunoda](#), [A. Monden](#) - Proceedings of the 38th International ACM SIGIR Conference on Research and Development in Information Retrieval, ACM, 2015. Cited by 10 Related articles All 1 v

Cite

Copy and paste a formatted citation or use one of the links to import into a bibliography manager.

MLA [Huang, Shanshan, et al. "Listwise Collaborative Filtering." *Proceedings of the 38th International ACM SIGIR Conference on Research and Development in Information Retrieval*. ACM, 2015.](#)

APA Huang, S., Wang, S., Liu, T. Y., Ma, J., Chen, Z., & Veijalainen, J. (2015, August). Listwise Collaborative Filtering. In *Proceedings of the 38th International ACM SIGIR Conference on Research and Development in Information Retrieval* (pp. 343-352). ACM.

Chicago Huang, Shanshan, Shuaiqiang Wang, Tie-Yan Liu, Jun Ma, Zhumin Chen, and Jari Veijalainen. "Listwise Collaborative Filtering." In *Proceedings of the 38th International ACM SIGIR Conference on Research and Development in Information Retrieval*, pp. 343-352. ACM, 2015.

Harvard Huang, S., Wang, S., Liu, T.Y., Ma, J., Chen, Z. and Veijalainen, J., 2015, August. Listwise Collaborative Filtering. In *Proceedings of the 38th International ACM SIGIR Conference on Research and Development in Information Retrieval* (pp. 343-352). ACM.

Vancouver Huang S, Wang S, Liu TY, Ma J, Chen Z, Veijalainen J. Listwise Collaborative Filtering. In Proceedings of the 38th International ACM SIGIR Conference on Research and Development in Information Retrieval 2015 Aug 9 (pp. 343-352). ACM.

[BibTeX](#) [EndNote](#) [RefMan](#) [RefWorks](#)

[\[PDF\] toyo.ac.jp](#)