ECML PKDD Discovery Challenge 2009
Tag Recommendations for Social Bookmarking Systems

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Knowledge & Data Engineering Group
University of Kassel

sponsored by
Tag Recommendations for Social Bookmarking Systems

- Support users during the tagging process
- Recommend tags on the posting page

http://www.kde.cs.uni-kassel.de(ws/dc09/)
Last Year's Tag Recommendation Results
Tasks

• Given a user and a resource, recommend up to five tags.

• Task 1: *Content-Based Tag Recommendations*
  ■ User, resource, or tags might be unknown

• Task 2: *Graph-Based Recommendations*
  ■ User, resource, and tags contained in training post-core

• Task 3: *Online Tag Recommendations*
  ■ Deliver live recommendations respecting timeouts, etc.

• 48h time for Tasks 1 & 2, Task 3 running for five weeks
Dataset

Social bookmarking data from BibSonomy
http://www.bibsonomy.org/

• Training data
  ■ Released on March 25th, 2009
  ■ Posts from BibSonomy up to 31st Dec. 2009
  ■ Complete snapshot: 3,617 users, 93,756 tags, 378,378 resources
  ■ Post-core at level 2: 1,185 users, 13,276 tags, 22,389 resources

• Test data
  ■ Released on July 6th, 2009
  ■ 6 months snapshot (2009-01-01 - 2009-06-30)
  ■ Task 1: 1,591 users, 34,045 tags, 40,729 resources, 43,002 posts
  ■ Task 2: 136 users, 862 tags, 667 resources, 778 posts
Dataset: Preprocessing, Identity, Post-core

• Preprocessing
  ■ Removed spam, posts from user *dblp*
  ■ Tag cleansing: only letters+numbers, common system tags removed

• Identity of resources
  ■ Intrahash + user name uniquely identifies a *post*
  ■ *Overlap* between resources by interhash

• Post-core at level 2
  ■ Each user, tag, resource appears in at least two posts
  ■ Iterative pruning process
  ■ Interhash to identify resources
Evaluation

- Test data = posts without tags
- Submitted data = recommended tags for the posts
- First 5 recommended tags compared against true tags from user (again, cleaning tags - only letters+numbers, no system tags)

- Precision and recall per post:

  \[ precision = \frac{|recommended \cap true|}{|recommended|} \quad recall = \frac{|recommended \cap true|}{|true|} \]

- Averaged over all posts

- Final criterion: F1-Measure = \[ \frac{2 \cdot precision \cdot recall}{precision + recall} \]
Participants & Submissions

- 150 registered mailing list users (= access to training data)
- 21 result submissions for each of the Tasks 1 & 2
- 27 paper submissions - 24 accepted
# Results Task 1

<table>
<thead>
<tr>
<th>submission</th>
<th>f1m</th>
<th>team</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.18740</td>
<td><strong>Tag Sources for Recommendation in Collaborative Tagging Systems</strong></td>
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<tr>
<td></td>
<td></td>
<td>Marek Lipczak, Yeming Hu, Yael Kollet, and Evangelos Milios</td>
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<tr>
<td>2</td>
<td>0.18001</td>
<td><strong>Content- and Graph-based Tag Recommendation: Two Variations</strong></td>
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<td></td>
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<td>Johannes Mrosek, Stefan Bussmann, Hendrik Albers, Kai Posdziech,</td>
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<td></td>
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<td>Benedikt Hengefeld, Nils Opperman, Stefan Robert, and Gerrit Spira</td>
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<td>0.17975</td>
<td>**A Weighting Scheme for Tag Recommendation in Social Bookmarking</td>
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<tr>
<td></td>
<td></td>
<td>Systems**</td>
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<td>Sanghun Ju and Kyu-Baek Hwang</td>
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Results Task 1

The graph shows the performance metric $f_1$ (y-axis) against the number of tags (x-axis). Different lines represent different algorithms or datasets, each identified by a unique ID. The metric increases as the number of tags increases, indicating improved performance with additional tags.
## Results Task 2

<table>
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<th>team</th>
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<td>1</td>
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<td><strong>Factor Models for Tag Recommendation in BibSonomy</strong></td>
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<td>Steffen Rendle and Lars Schmidt-Thieme</td>
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<td><strong>Relational Classification for Personalized Tag Recommendation</strong></td>
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<td>Leandro Balby Marinho, Christine Preisach, and Lars Schmidt-Thieme</td>
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<td><strong>Tag Sources for Recommendation in Collaborative Tagging Systems</strong></td>
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<td>Marek Lipczak, Yeming Hu, Yael Kollet, and Evangelos Milios</td>
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<td>76565</td>
<td><strong>A Collaborative Filtering Tag Recommendation System based on Graph</strong></td>
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<td>Yuan Zhang, Ning Zhang, and Jie Tang</td>
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Results Task 2

The diagram shows the performance of different models (labeled as 79768, 80999, 30478, 76565, 82722) on the number of tags. The y-axis represents the performance metric, and the x-axis represents the number of tags. The models show varying trends as the number of tags increases.
Lessons learnt

• Task 1 = mostly unknown data
  ■ Keep it simple
  ■ Gather tags from various sources (title, content, external services, different spellings)
  ■ Re-order tags for personalization
  ■ Clever selection and combination strategies win

• Task 2 = user, resource, tags known
  ■ Sophisticated methods are useable and useful
  ■ Factor models, classification, graph-based, CF, etc.
  ■ Simple methods work, too

Since Task 1 is the >90% case, use simple methods (they're quick, too!)
Thanks

- Conference organizers, in particular Tina Anzic
- Our sponsors
- YOU - for your vivid participance
Schedule

9:00 - 10:30
- Welcome & Introduction
- Tag Sources for Recommendation in Collaborative Tagging Systems - Marek Lipczak, Yeming Hu, Yael Kollet, and Evangelos Milios
- Factor Models for Tag Recommendation in BibSonomy - Steffen Rendle and Lars Schmidt-Thieme

10:30 - 11:00
- Coffee Break (+poster preparation)
### Schedule

**11:00 - 12:30**

- **Content- and Graph-based Tag Recommendation: Two Variations** - Johannes Mrosek, Stefan Bussmann, Hendrik Albers, Kai Posdziech, Benedikt Hengefeld, Nils Opperman, Stefan Robert, and Gerrit Spira  PDF
- **Relational Classification for Personalized Tag Recommendation** - Leandro Balby Marinho, Christine Preisach, and Lars Schmidt-Thieme PDF
- **A Weighting Scheme for Tag Recommendation in Social Bookmarking Systems** - Sanghun Ju and Kyu-Baek Hwang PDF

**12:30 - 14:00**

- Lunch
14:00 - 15:20
- A Collaborative Filtering Tag Recommendation System based on Graph - Yuan Zhang, Ning Zhang, and Jie Tang  PDF
- Minute Madness: Every poster presenter has one minute to convince everybody to look at his/her poster.
- Closing Session

15:20 - 15:40
- Coffee Break (+ poster preparation)

15:40 - 17:00
- Poster Session

17:20 - 18:00
- Conference Opening & Awards