



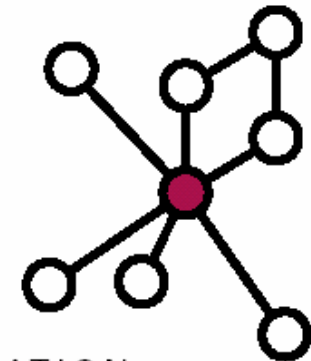
Ranking in Folksonomies

Andreas Hotho

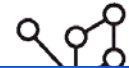
Robert Jäschke

Christoph Schmitz

Gerd Stumme



BibSonomy - a Folksonomy/Web 2.0 System



BibSonomy :: user :: hotho :: folksonomy ranking

A blue social bookmark and publication sharing system.

tags · groups · popular
myBibSonomy · post bookmark · post bibtex

logged in as hotho · help · faq · blog
15 picked to download · friends · settings · logout

bookmarks **RSS**

previous | next edit

CollaborativeRank -- del.icio.us search engine
to search folksonomy tools collaborative del.icio.us seminar2006 ranking and 3 other people on 2006-04-20 10:04:48 edit delete

RawSugar
RawSugar is a social search engine powered by user contributions. We're an online community, with over 170,000 URLs already tagged by our members. Save and organize your favorite webpages along with your notes to share with your friends and community. Publish your directory with RawSugar patented guided search and earn \$\$.

publications **RSS** **BibTeX**

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CollaborativeRank: Motivating People to Give Helpful and Timely Ranking

related tags
folksonomy ranking from all users

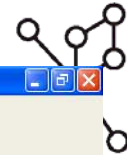
tags

2 2003 2004
ics access acm
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ng annotation
tispam antwort
ation approach
zeiten arbitrary
arzt association
attribute audio
skunft author
ito automated
ound bahn bank
batch bayes
nchmark bericht
hreibung best
o bibliographic
k bibsonomy
illig binding bio
cal biology bisec
bok bookmark

Showing 100 items per page. Show 10, 25, 50, 100

- Social Resource sharing systems:**
- Collaborative annotation of web resources
 - “Tagging” of resources with freely chosen keywords
 - Ease of use, open for everybody
 - Direct advantage with low additional expenses
 - Complementing semantic web effort
 - Emergent semantics

BibSonomy - a Folksonomy/Web 2.0 System



BibSonomy::tag:web2.0 - Opera

File Edit View Bookmarks Feeds Tools Help

Open Save Print Find Home Panels Tile Cascade Voice

Bib myBib postBook postBib GNews heise Spiegel Netvibes kde Nagios MW - KDE km WBS studi Links Wetter KS mydel CUL Post CUL IQ Biblicious: postBookmark postPublication goofy BibSonomy::tag:lecture k...

New page Transfers BibSonomy::tag:web... x

http://www.bibsonomy.org/tag/web2.0

RSS Google search 70%

BibSonomy :: tag :: web2.0

A blue social bookmark and publication sharing system

tags groups popular myBibSonomy post bookmark post bibtax

bookmarks RSS

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Web 2.0 Tool-List: Category: Groupware
Zusammenfassend von Gruppen ereignissen (Kalendar, Kalender, Projekt)
to list web2.0 groupware tools category seminar2006 by betayer on 2006-06-06 07:56:21 (00p)

Kiko - A New Kind of Online Calendar
to web2.0 groupware calendar tool seminar2006 by betayer and 2 other people on 2006-06-06 07:52:04 (00p)

Welcome to Google Calendar
to web2.0 groupware calendar tool seminar2006 by betayer on 2006-06-06 07:51:16 (00p)

= openBC =
to web2.0 social tool seminar2006 business network by betayer on 2006-06-06 07:49:15 (00p)

Xanga.com - The Weblog Community
to web2.0 blogs publishing blogging tool seminar2006 blog community by betayer on 2006-06-05 22:14:00 (00p)

Blogger: Erstellen Sie jetzt Ihr Blog - KOSTENLOS
to web2.0 blogs publishing blogging tool seminar2006 blog by betayer and 1 other person on 2006-06-05 22:13:12 (00p)

Welcome to Wikispaces - Wikis for Everyone
to web2.0 publishing wiki tool seminar2006 by betayer on 2006-06-05 22:12:00 (00p)

BareWiki
to web2.0 publishing wiki tool seminar2006 by betayer on 2006-06-05 22:11:34 (00p)

Web 2.0 Tool-List: Category: Publishing
Veröffentlichungen von Wissen, Meinungen (Wiki, Blog)
to list web2.0 tools publishing category seminar2006 by betayer on 2006-06-05 22:10:53 (00p)

toEat.com: Hungry? Lost? We can help!
to web2.0 restaurant mass mapping eat tool map seminar2006 mashup food rating restaurants by betayer on 2006-06-05 22:03:14 (00p)

Platial.com
to web2.0 mass mapping google tool map seminar2006 mashup by betayer and 2 other people on 2006-06-05 21:57:12 (00p)

Placeopedia.com - Connecting Wikipedia articles with their locations
to geographic web2.0 mass mapping google tool map seminar2006 mashup wikipedia by betayer and 1 other person on 2006-06-05 21:57:04 (00p)

Google Maps
to web2.0 mass mapping google tool map seminar2006 by betayer and 3 other people on 2006-06-05 21:56:52 (00p)

Web 2.0 Tool-List: Category: Mapping
Verbinden von Standorten mit beliebigen Informationen (Mashups, mit Google Maps)
to list web2.0 mapping tools category seminar2006 by betayer on 2006-06-05 21:56:28 (00p)

Web 2.0 Tool-List: Category: Portals
Portale für Web 2.0 Aktivitäten (Weblogs, Weblogs (Blogposts))
to list web2.0 tools category seminar2006 portals by betayer on 2006-06-05 21:53:28 (00p)

Netvibes (25)
to web2.0 portal tool mashup seminar2006 by betayer and 9 other people on 2006-06-05 21:41:19 (00p)

Pageflakes - The whole Web at your Fingertips!
to web2.0 portal tool sharing mashup seminar2006 website publish by betayer and 8 other people on 2006-06-05 21:43:03 (00p)

Web 2.0 Tool-List: Category: Folksonomies
Gemeinschaftliches industrielles (tagging) von Inhalten
to list web2.0 tools folksonomies category seminar2006 by betayer on 2006-06-05 21:46:34 (00p)

Web 2.0 Tool-List: Category: Programms
Online-Aktivitäten für Content-Programme
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Web 2.0 Tool-List: Category: Multimedia Filesharing
Tools die hauptsächlich dem Austausch von Multimediale Inhalten dienen

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David Miller and Jonathan Penberg and Bernard Kerr, eSolutions (2006)
to socialbookmarking web2.0 socialsoftware by berr and 8 other people on 2006-05-30 16:39:24 (pik00p) URL, BibTeX

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Tony Hammond and Timo Hamay and Ben Lund and Joanne Scott, D-Lib Magazine (2006)
to web2.0 socialbookmarking codr counsellor by seimg and 10 other people on 2006-05-19 09:50:43 (pik00p) URL, BibTeX

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Michele Tepper, netWorker (2006)
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Peter Mika, International Semantic Web Conference (2006)
to web2.0 folksonomies socialsoftware ontologies by seimg and 14 other people on 2006-05-19 09:45:46 (pik00p) URL, BibTeX

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Peer Heise and Christoph Schone and York Sure, eSolutions (2006)
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Max Völkel and Markus Kitzmann and Denny Völk, eSolutions (2006)
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to web2.0 folksonomy tagging tag by seimg and 1 other person on 2006-04-11 17:42:11 (pik00p) BibTeX

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Steven Adler, netWorker (2006)
to web2.0 webos desktops socialsoftware by seimg and 1 other person on 2006-04-11 17:42:11 (pik00p) BibTeX

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Arnt Hildebrandt (2006)
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Architectural Styles and the Design of Network-based Software Architectures

logged in as hotto - help - faq - blog
15 picked to download - friends - settings - logout

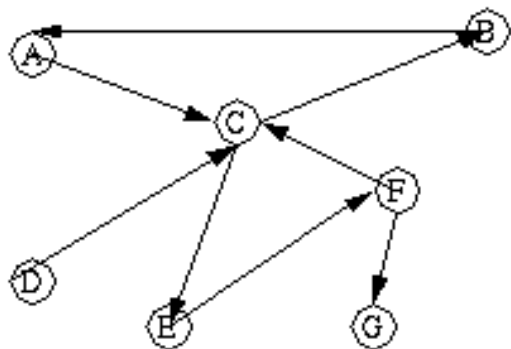
related tags
+ seminar2006 + ajax + tool + tools + social + web + socialsoftware + folksonomy + tagging + software + rss + collaboration + blog + community + internet + free + design + wiki + search + tags + sharing + socialsoftware + google + technology + javascript + api + webservices + bookmarks + AJAX + ajax + rest + productivity + library + RSS + video + podcast + blogs + online + office + network + cool + library2.0 + portal + news + multimedia + socialnetworking + service + reference + mashup + flickr

- ## Search in Social Bookmark systems:
- search for tag and user/tag possible
 - result list is usually very long and ranked only by date (e.g. web2.0)
 - restriction with additional tags possible (e.g. ajax)
 - a good ranking would be very helpful
 - main information in a folksonomy: user posting items with a certain tag if it is of interest

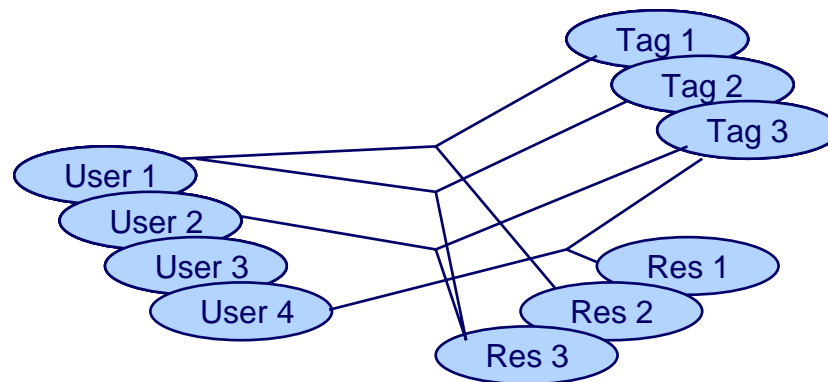
Search in Folksonomies



- PageRank in the web: pages are important if a lot of important pages are linking to them
- authority values in a folksonomy are propagated along the hyperlink structure of the folksonomy



Web-Graph



Folksonomies

Overview



- Introduction/Motivation
- FolkRank
- Evaluation
- Conclusion/Outlook



A *folksonomy* is a tuple $F := (U, T, R, Y, \prec)$ where

- U , T , and R are finite sets, whose elements are called *users*, *tags* and *resources*, resp.
- Y is a ternary relation between them, i.e. $Y \subseteq U \times T \times R$, called tag assignments (TAS for short) and
- \prec is a user specific subtag/supertag relation, i.e. $\prec \subseteq U \times T \times T$, called subtag/supertag relation

The *personomy* P_u of a given user u is the restriction of F to u .

Converting a Folksonomy into an Undirected Graph



- Set V of nodes consists of the disjoint union of the sets of tags, users and resources:

$$V = U \cup T \cup R$$

- All co-occurrences of users and tags, tags and resources, users and resources become edges between the respective nodes:

$$E = \{\{u, t\} \mid \exists r \in R : (u, t, r) \in Y\} \cup \\ \{\{t, r\} \mid \exists u \in U : (u, t, r) \in Y\} \cup \\ \{\{u, r\} \mid \exists t \in T : (u, t, r) \in Y\}$$

Overview



- Introduction/Motivation
- **FolkRank**
- Evaluation
- Conclusion/Outlook



Computation of fixed point R of the weight spreading

$$R \leftarrow c(AR + P)$$

- A is the adjacency matrix reflecting the graph
- $P = \rho \cdot \mathbf{1}$: random surfer

A Folksonomy adapted PageRank



Adaptation for folksonomy: undirected edge \rightarrow 2 directed edges

We spread weight as follows:

$$R \leftarrow c(\alpha R + \beta AR + \gamma P)$$



Problem with the adapted PageRank version:

- Graph is undirected \rightarrow weight flows in one direction and directly “swashes back”

Idea to solve this is to apply a differential approach:

- Let R_{AP} be the fixed point with $\gamma = 0$
- Let R_{pref} be the fixed point with $\gamma > 0$
- $R := R_{pref} - R_{AP}$ is the final weight vector

Overview



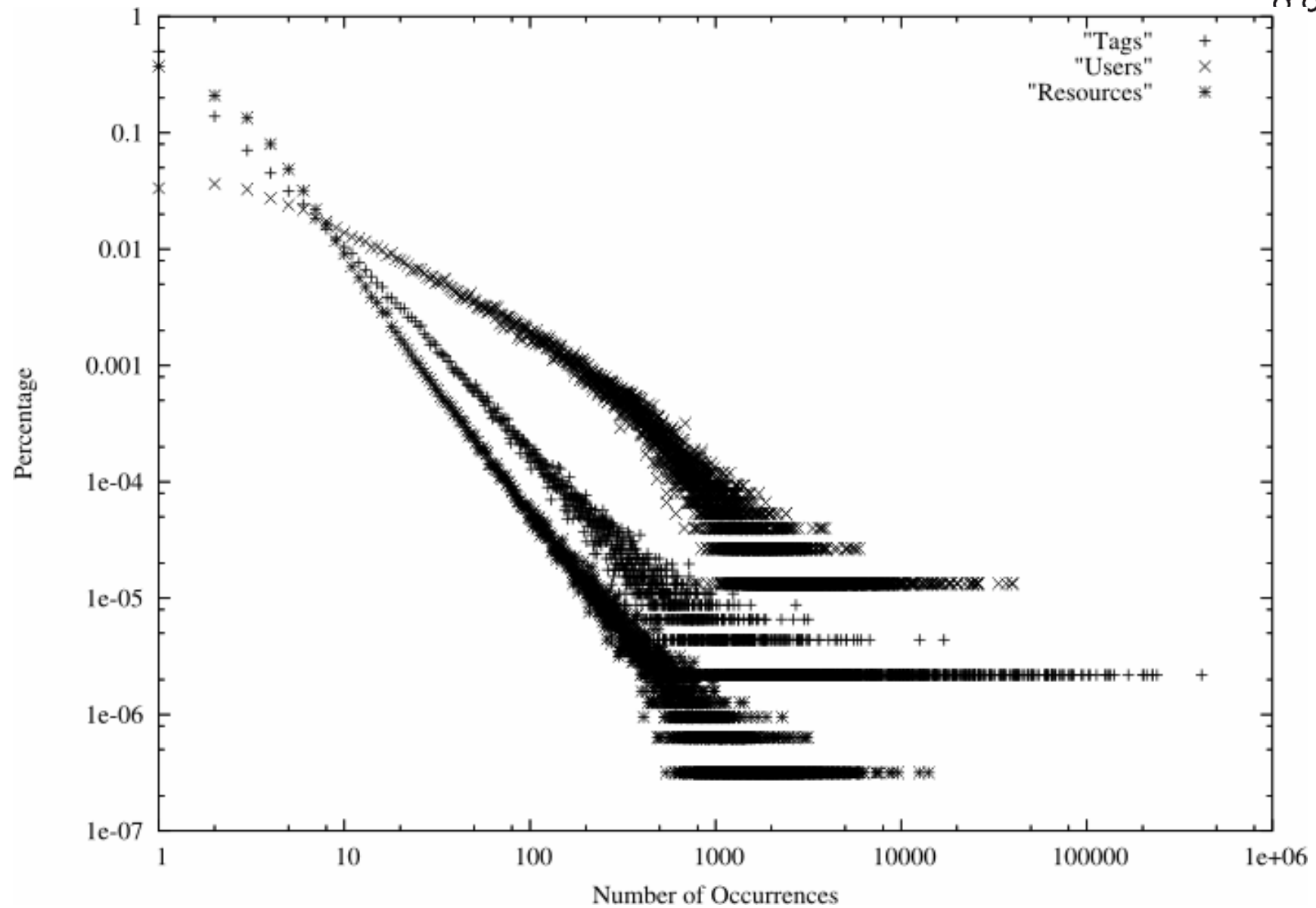
- Introduction/Motivation
- FolkRank
- **Evaluation**
- Conclusion/Outlook



Crawled del.icio.us from July 27 to 30, 2005
obtained a core folksonomy with

- $|U| = 75,242$ users,
- $|T| = 533,191$ tags and
- $|R| = 3,158,297$ resources, related by in total
- $|Y| = 17,362,212$ tag assignments (TAS)

Results: Power Law distribution



Results: adapted PageRank



Tag	ad. PageRank
system:unfiled	0,0078404
web	0,0044031
blog	0,0042003
design	0,0041828
software	0,0038904
music	0,0037273
programming	0,0037100
css	0,0030766
reference	0,0026019
linux	0,0024779
tools	0,0024147
news	0,0023611
art	0,0023358
blogs	0,0021035
politics	0,0019371
java	0,0018757
javascript	0,0017610
mac	0,0017252
games	0,0015801
photography	0,0015469
fun	0,0015296

User	ad. PageRank
shankar	0,0007389
notmuch	0,0007379
fritz	0,0006796
ubi.quito.us	0,0006171
weev	0,0005044
kof2002	0,0004885
ukquake	0,0004844
gearhead	0,0004820
angusf	0,0004797
johncollins	0,0004668
mshook	0,0004556
frizzlebiscuit	0,0004543
rafaspol	0,0004535
xiombarg	0,0004520
tidesonar02	0,0004355
cyrusnews	0,0003829
bldurling	0,0003727
onpause_tv_anytime	0,0003600
cataracte	0,0003462
triple_entendre	0,0003419
kayodeok	0,0003407

Results: adapted PageRank



http://slashdot.org/	0,0002613
http://pchere.blogspot.com/2005/02/absolutely-delicious-complete-tool.html	0,0002320
http://script.aculo.us/	0,0001770
http://www.adaptivepath.com/publications/essays/archives/000385.php	0,0001654
http://johnvey.com/features/deliciousdirector/	0,0001593
http://en.wikipedia.org/wiki/Main_Page	0,0001407
http://www.flickr.com/	0,0001376
http://www.goodfonts.org/	0,0001349
http://www.43folders.com/	0,0001160
http://www.csszengarden.com/	0,0001149
http://wellstyled.com/tools/colourscheme2/index-en.html	0,0001108
http://pro.html.it/esempio/nifty/	0,0001070
http://www.alistapart.com/	0,0001059
http://postsecret.blogspot.com/	0,0001058
http://www.beelerspace.com/index.php?p=890	0,0001035
http://www.techsupportalert.com/best_46_free_utilities.htm	0,0001034
http://www.alvit.de/web-dev/	0,0001020
http://www.technorati.com/	0,0001015
http://www.lifehacker.com/	0,0001009
http://www.luczappa.com/brilliantMaker/buttonImage.php	0,0000992
http://www.engadget.com/	0,0000984

Results: boomerang



Preference for tag: boomerang

PageRank without preference		PageRank with preference		FolkRank with preference	
Tag	ad. PageRank	Tag	ad. PRank	Tag	FolkRank
system:unfiled	0,0078404	boomerang	0,4036883	boomerang	0,4036867
web	0,0044031	shop	0,0069058	shop	0,0066477
blog	0,0042003	lang:de	0,0050943	lang:de	0,0050860
design	0,0041828	software	0,0016797	wood	0,0012236
software	0,0038904	java	0,0016389	kassel	0,0011964
music	0,0037273	programming	0,0016296	construction	0,0010828
programming	0,0037100	web	0,0016043	plans	0,0010085
css	0,0030766	reference	0,0014713	injuries	0,0008078
reference	0,0026019	system:unfiled	0,0014199	pitching	0,0007982
linux	0,0024779	wood	0,0012378	rdf	0,0006619
tools	0,0024147	kassel	0,0011969	semantic	0,0006533
news	0,0023611	linux	0,0011442	material	0,0006279
art	0,0023358	construction	0,0011023	trifly	0,0005691
blogs	0,0021035	plans	0,0010226	network	0,0005568
politics	0,0019371	network	0,0009460	webring	0,0005552
java	0,0018757	rdf	0,0008506	sna	0,0005073
javascript	0,0017610	css	0,0008266	socialnetworkanalysis	0,0004822
mac	0,0017252	design	0,0008248	cinema	0,0004726
games	0,0015801	delicious	0,0008097	erie	0,0004525
photography	0,0015469	injuries	0,0008087	riparian	0,0004467
fun	0,0015296	pitching	0,0007999	erosion	0,0004425

Results: Semantic Web



Preference for resource: <http://www.semanticweb.org>

PageRank without preference

Tag	ad. PageRank
system:unfiled	0,0078404
web	0,0044031
blog	0,0042003
design	0,0041828
software	0,0038904
music	0,0037273
programming	0,0037100
css	0,0030766
reference	0,0026019
linux	0,0024779
tools	0,0024147
news	0,0023611
art	0,0023358
blogs	0,0021035
politics	0,0019371
java	0,0018757
javascript	0,0017610
mac	0,0017252
games	0,0015801
photography	0,0015469
fun	0,0015296

PageRank with preference

Tag	ad. PRank
semanticweb	0,0208605
web	0,0162033
semantic	0,0122028
system:unfiled	0,0088625
semantic_web	0,0072150
rdf	0,0046348
semweb	0,0039897
resources	0,0037884
community	0,0037256
xml	0,0031494
research	0,0026720
programming	0,0025717
css	0,0025290
portal	0,0024118
.imported	0,0020495
imported-bo...	0,0019610
en	0,0018900
science	0,0018166
.idate2005-04-11	0,0017779
newfurl	0,0017578
internet	0,0016122

FolkRank with preference

Tag	FolkRank
semanticweb	0,0207820
semantic	0,0121305
web	0,0118002
semantic_web	0,0071933
rdf	0,0044461
semweb	0,0039308
resources	0,0034209
community	0,0033208
portal	0,0022745
xml	0,0022074
research	0,0020378
imported-bo...	0,0018920
en	0,0018536
.idate2005-04-11	0,0017555
newfurl	0,0017153
tosort	0,0014486
cs	0,0014002
academe	0,0013822
rfd	0,0013456
sem-web	0,0013316
w3c	0,0012994

Results: Semantic Web



http://www.semanticweb.org/	0,3761957
http://flink.semanticweb.org/	0,0005566
http://simile.mit.edu/piggy-bank/	0,0003828
http://www.w3.org/2001/sw/	0,0003216
http://infomesh.net/2001/swintro/	0,0002162
http://del.icio.us/register	0,0001745
http://mspace.ecs.soton.ac.uk/	0,0001712
http://www.adaptivepath.com/publications/essays/archives/000385.php	0,0001637
http://www.ontoweb.org/	0,0001617
http://www.aaai.org/AITopics/html/ontol.html	0,0001613
http://simile.mit.edu/	0,0001395
http://itip.evcc.jp/itipwiki/	0,0001256
http://www.google.be/	0,0001224
http://www.letterjames.de/index.html	0,0001224
http://www.daml.org/	0,0001216
http://shirky.com/writings/ontology_overrated.html	0,0001195
http://jena.sourceforge.net/	0,0001167
http://www.alistapart.com/	0,0001102
http://www.federalconcierge.com/WritingBusinessCases.html	0,0001060
http://pche.re.blogspot.com/2005/02/absolutely-delicious-complete-tool.html	0,0001059
http://www.shirky.com/writings/semantic_syllogism.html	0,0001052

Overview



- Introduction/Motivation
- FolkRank
- Evaluation
- Conclusion/Outlook



- Folksonomies might overcome the knowledge acquisition bottleneck through ease of use and growing amount of users
- Our ranking is just based on the structure of the folksonomy - contents of resources not used
- Suitable for intranets
 - resources are typically not hyperlinked
 - community building is important
- Recommend probably relevant documents to user

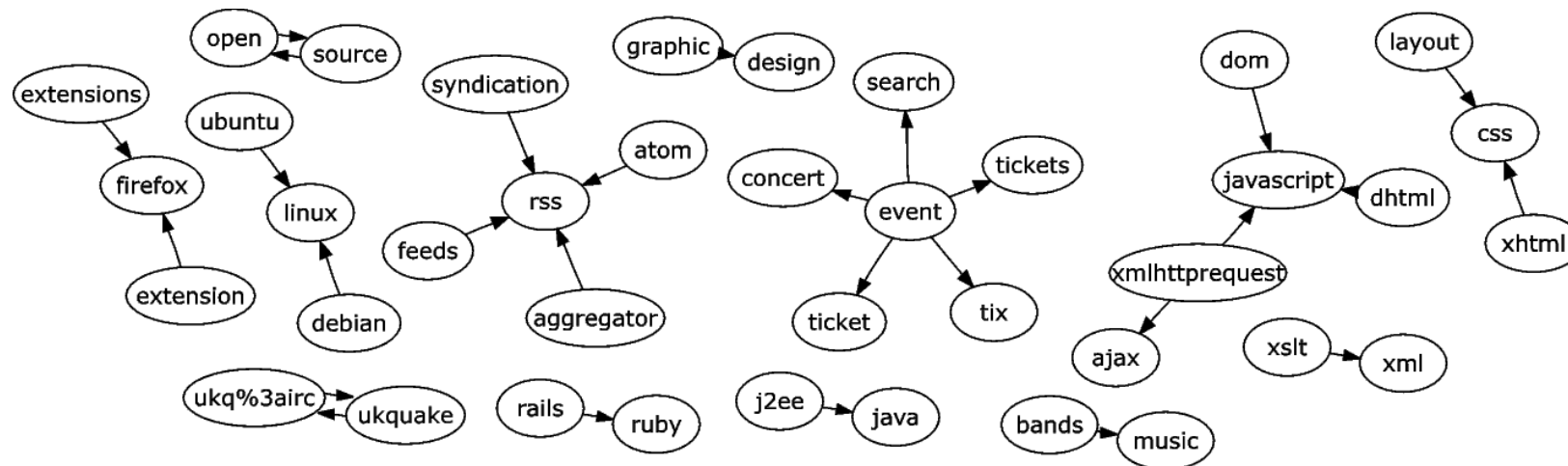


- Further development will include more structural elements like relations between tags in a personomy
- Suggest tags for user, find users with related interests, learn relations

Outlook

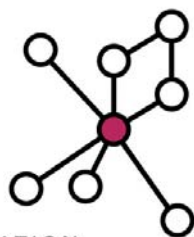


- Application of other techniques
- e.g. Association Rule Mining for Community Building





U N I K A S S E L
V E R S I T Ä T



ENDOWED CHAIR OF THE HERTIE FOUNDATION
Knowledge and Data Engineering
DEPARTMENT OF MATHEMATICS & COMPUTER SCIENCE

Agenda

- Introduction/Motivation
- FolkRank
- Evaluation
- Conclusion/Outlook



Thank you for
your attention!

<http://www.bibsonomy.org/>