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Workshop on Collective Intelligence on Semantic Web (CISW 2007)

Tag Meaning Disambiguation

through Analysis of Tripartite Structure of Folksonomies

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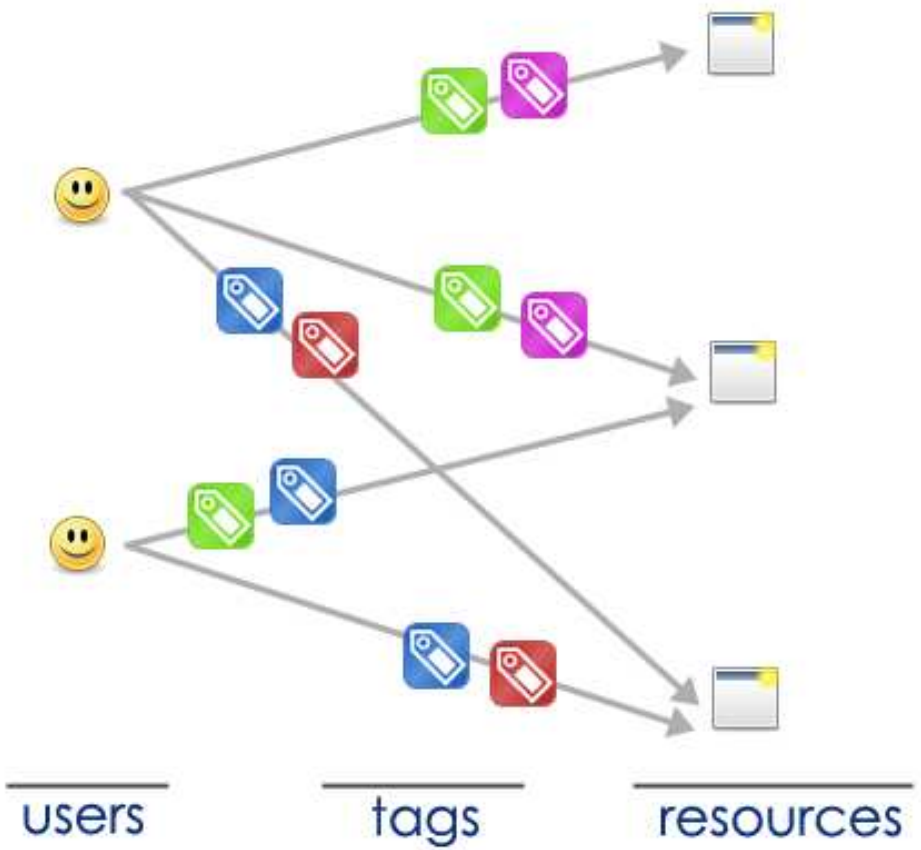
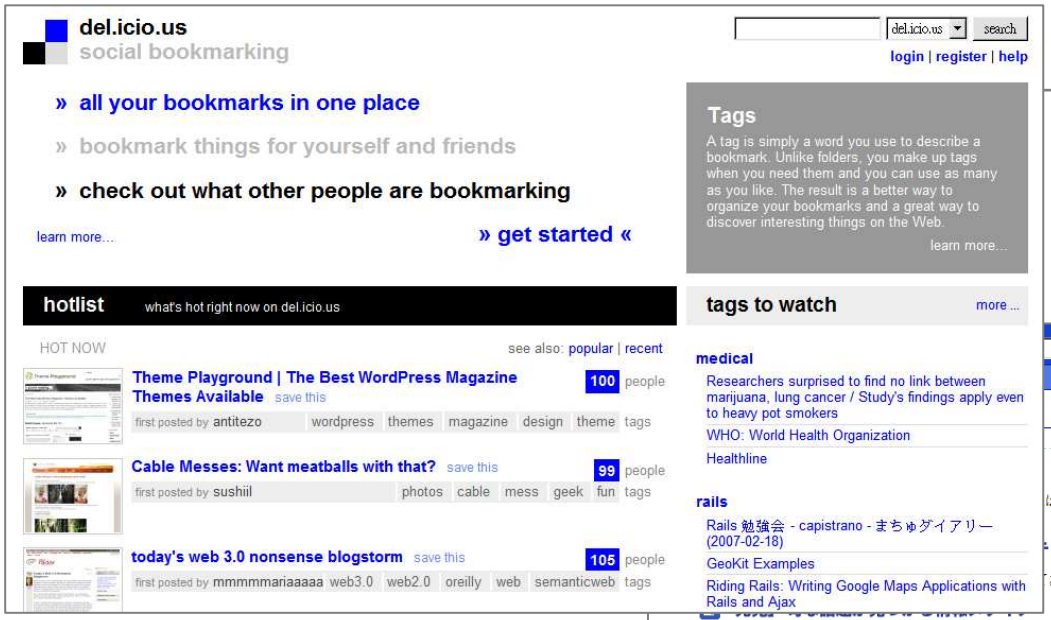
Overview

- Background
- Motivations
- Tripartite structure of folksonomies
- Tag meaning disambiguation
- Experiments
- Conclusions and future work

- ***Collaborative tagging systems*** and ***folksonomies***



- Examples of collaborative tagging systems



http://del.icio.us/

http://b.hatena.ne.jp/

Background

- Advantages [Adam 2004, Wu et al. 2006]
  - Freedom and flexibility
  - Quick adaptation to changes in vocabulary (e.g. ajax, youtube)
  - Convenience and serendipity
- Disadvantages [Adam 2004, Wu et al. 2006]
  - Ambiguity (e.g. apple, sf, opera)
  - Lack of format (e.g. how multiword tags are handled)
  - Existence of synonyms (e.g. semweb, semanticweb, semantic_web)
  - Lack of semantics

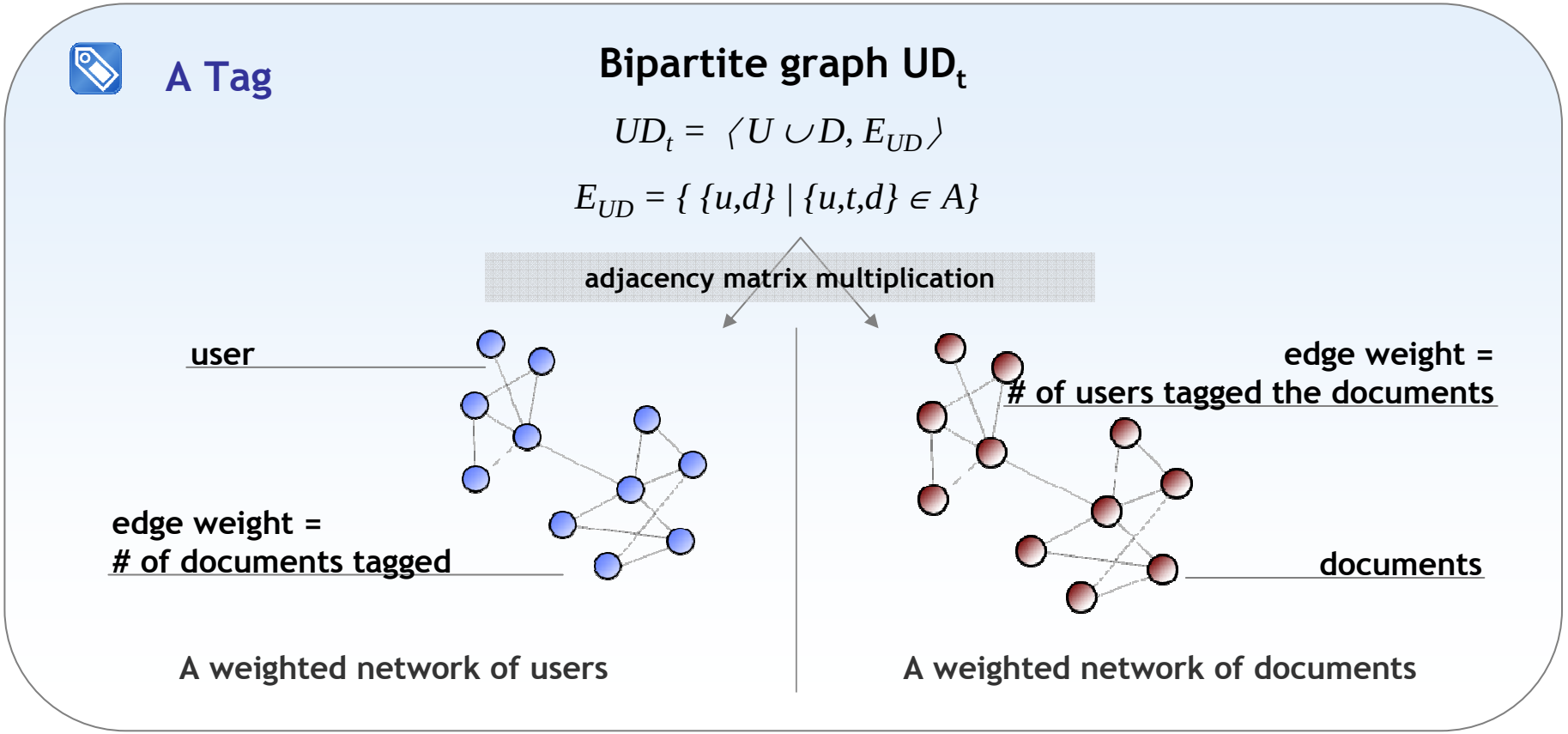
Motivations

- Many tags are ambiguous (possess multiple meanings)
- This affects the precision of retrieval and annotation of shared resources
- Current research works mainly focus on clustering of tags
- Few works deal with ambiguous tags, and in indirect ways only (e.g. [Wu et al. 2006])

Tripartite structure of folksonomies

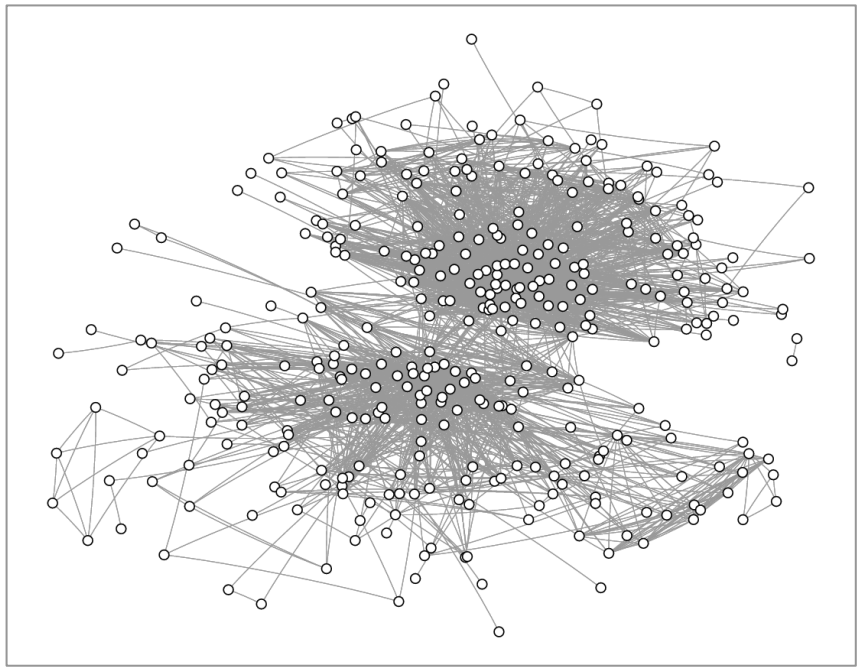
Folksonomy (A hypergraph)

$$F = \langle U, T, D, A \rangle; A \subseteq U \times T \times D$$

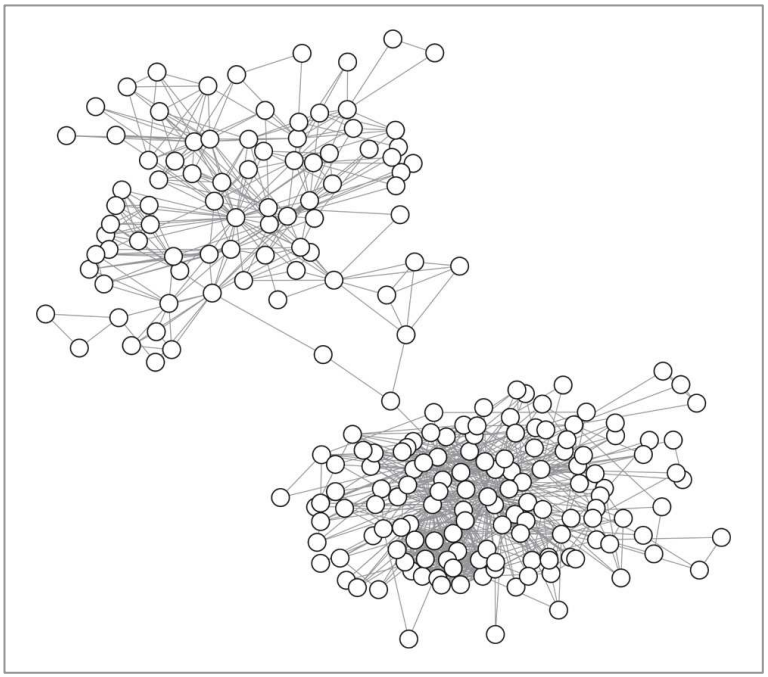


A case study

- *sf* in *del.ici.ous* [Au Yeung et al. 2007]



Network of Documents



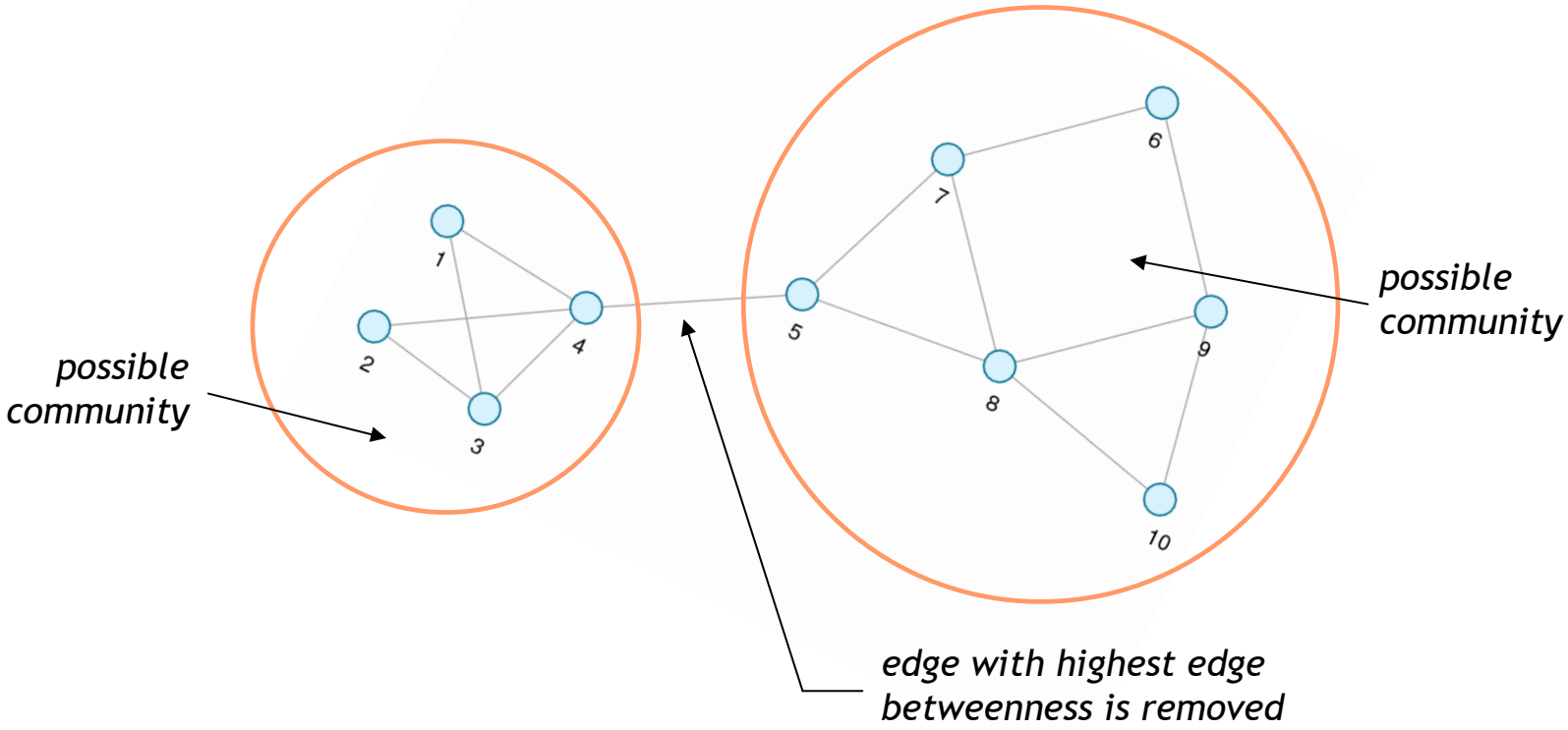
Network of Users

Tag Meaning Disambiguation

- Basic ideas
  - Different clusters of nodes in the network correspond to different meanings of the tag
  - Different meanings of ambiguous tags can be obtained by partitioning the network into communities of nodes
  - The meanings can be understood by examining the most frequently used tags within a cluster

- Algorithms for discovering communities in a network
  - ***Modularity optimization by removing edges based on edge betweenness*** [Newman & Girvan 2004]
  - ***Modularity***: a measure of the "goodness" of a partition of a network
  - ***Edge betweenness***: a measure of how likely an edge is a bridge between two communities

Tag Meaning Disambiguation



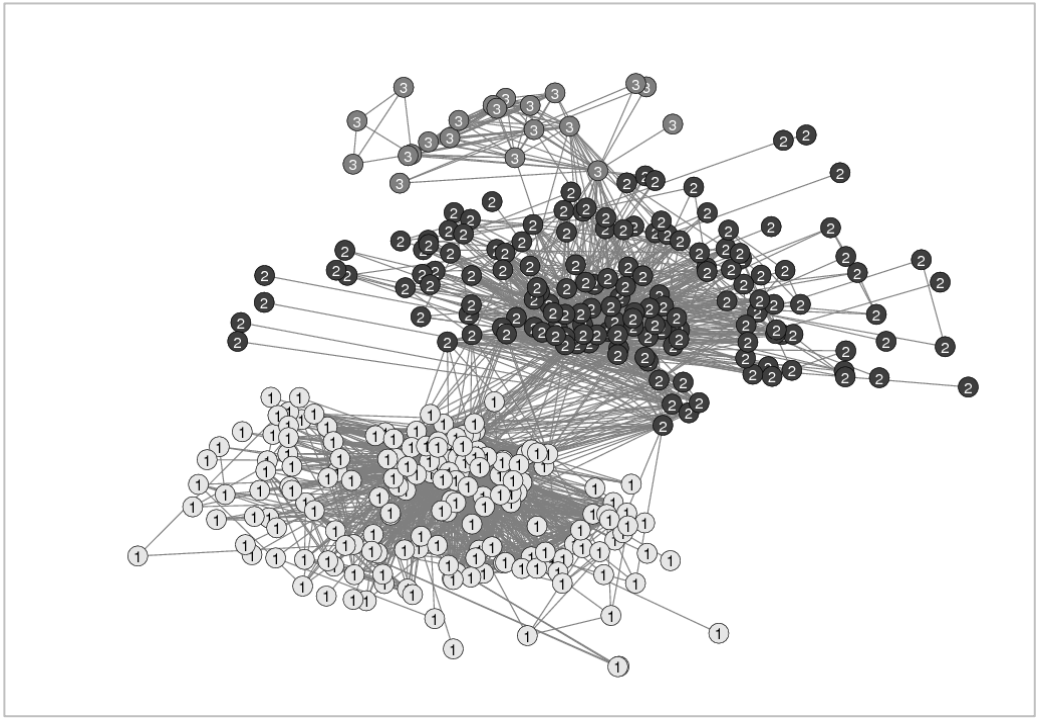
edge betweenness of edge ***e*** = number of shortest path running through ***e***

(most likely to be a bridge between two communities in the network)

- Proposed method

1. Collect tagging data of the tag to be disambiguated (including ***documents*** with the tag, ***users*** and other ***tags*** involved)
2. Construct a ***document network*** out of the data
3. Apply the ***community-discovering algorithm*** to the network
4. For each community discovered, extract the ***10 most frequently used tags*** among those documents
5. The sets of tags should give different meanings of the tag being examined

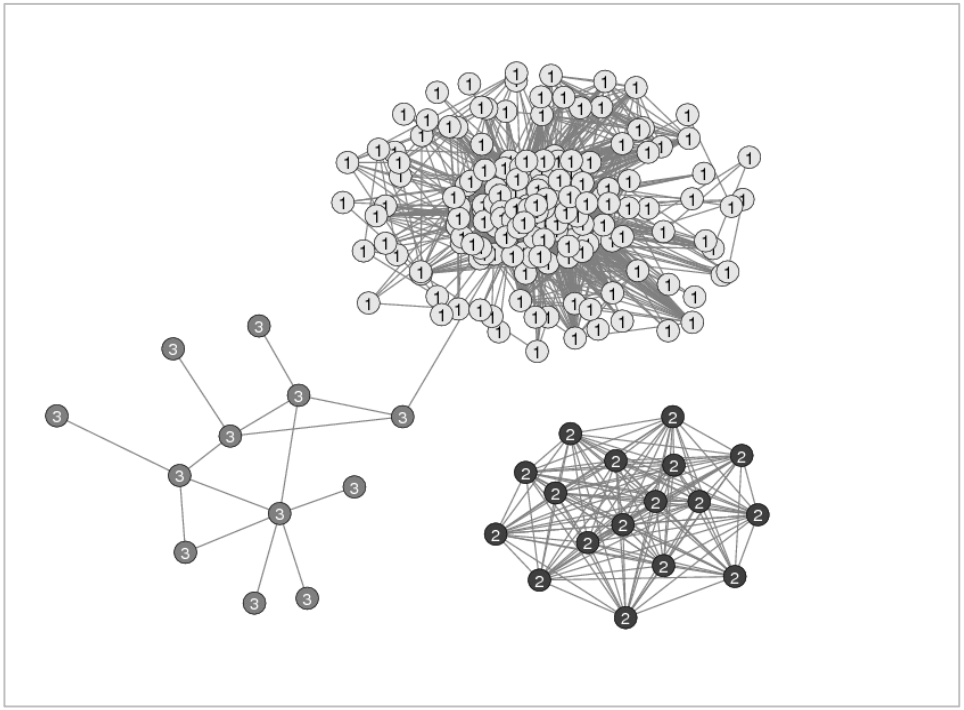
Experiments



Cluster	Tags
1	sf, scifi, fiction, books, sci-fi, writing, literature, science, sciencefiction, fantasy
2	sf, sanfrancisco, bayarea, san, francisco, california, travel, events, art, san_francisco
3	sf, sanfrancisco, design, bayarea, blog, food, todo, california, shopping, san

Disambiguation of the tag **"sf"**

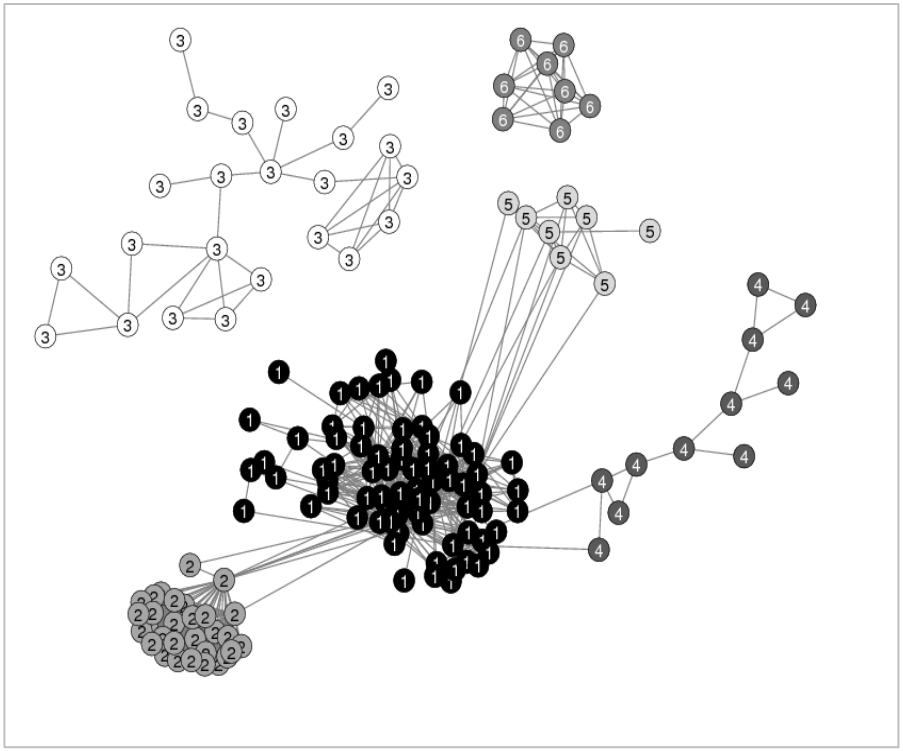
Experiments



Cluster	Tags
1	opera, browser, web, software, javascript, browsers, tips, tools, internet, firefox
2	opera, shopping, imported, shop, design, store, home, inspiration, work, personal
3	opera, music, musique, classical, art, culture, musica, musica, classic, travel

Disambiguation of the tag **"opera"**

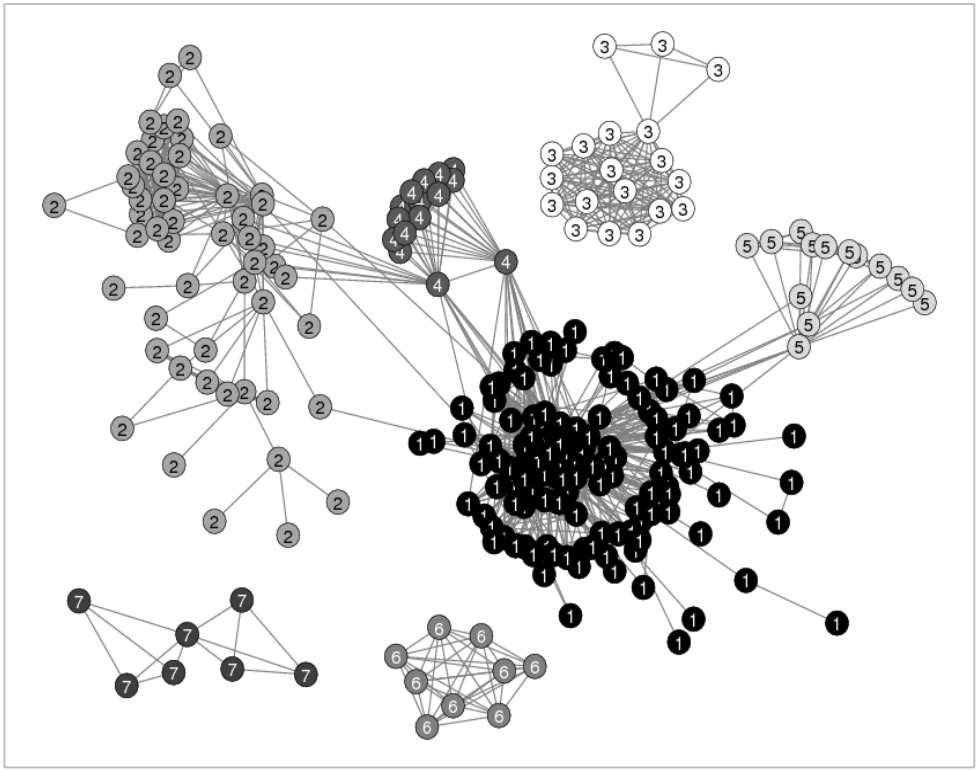
Experiments



Cluster	Tags
1	cambridge, university, uk, england, science, cam, local, cambridgeuniversity, research, community
2	cambridge, bcc_school, activism, education, community, contact, bcc, politics, critical_economy, blog
3	cambridge, boston, restaurants, food, massachusetts, imported, local, restaurant, venues, clubs
4	cambridge, english, cpe, cae, boston, online, fce, exam, inglés, esl
5	cambridge, mappingurbanism, visualisation, design, social, information, maps, mapping, infovis, toread
6	cambridge, letting, uk, photography, search, property, flats, cambsproperty, financial, fundraising

Disambiguation of the tag **"cambridge"**

Experiments



Cluster	Tags
1	tube, london, underground, travel, transport, maps, uk, map, subway, reference
2	tube, diy, audio, electronics, amp, amplifier, amps, tubes, guitar, music
3	tube, video, web, internet, tv, online, web2.0, media, videos, imported
4	tube, video, youtube, videos, funny, cool, interesting, sport, fun, humor
5	tube, video, videos, online, web2.0, youtube, free, media, movie, fun
6	tube, youtube, video, videos, cool, feel.good, fun, funny, flash, music
7	tube, radio, electronics, tubes, antique, amplifier, data, audio, info, incarnate

Disambiguation of the tag **"tube"**

Discussions

- Different meanings of a tag can be obtained from the result
- However, some problems exist:
  1. The meaning of a tag in some clusters is unclear (as in the results of *opera*, *cambridge*)
  2. Some clusters correspond to the same meaning of a tag (as in the result of *tube*)
  3. Some clusters correspond to the same meaning of a tag, but referring to such meaning in possibly different contexts (as in the result of *sf*)

Conclusions and future work

- Conclusions
  - The method is effective in clustering documents of different topic and discover the different meanings of a tag
  - Some post-processing may be required to clean up redundant or unclear clusters
- Future work
  - To improve the efficiency of the method by employing faster algorithms (e.g. [Clauset et al. 2004])
  - Investigate how the results can be refined to produce more useful disambiguation
  - Perform Larger scale of evaluation of the proposed method

References

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