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Discovering and Modelling

Multiple Interests of Users in Collaborative Tagging Systems

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User Interests and User Profiles

- User profiling is important in enabling recommendation systems
- (1) Collecting user data
  (2) Representing user interests
- Collaborative tagging systems provide rich information about user interests
- How can we make use of this information?

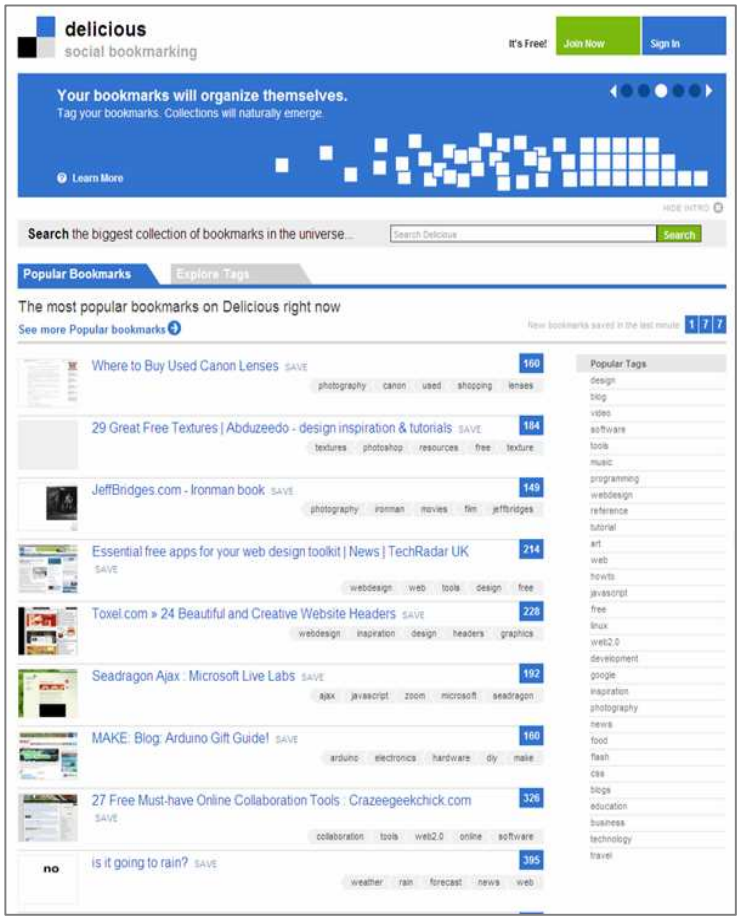
Folksonomies and Personomies

Folksonomies: products of collaborative tagging systems

$F = (U, T, D, A)$
U: User; T: Tag; D: Document;
$A = U \times T \times D$: Annotation

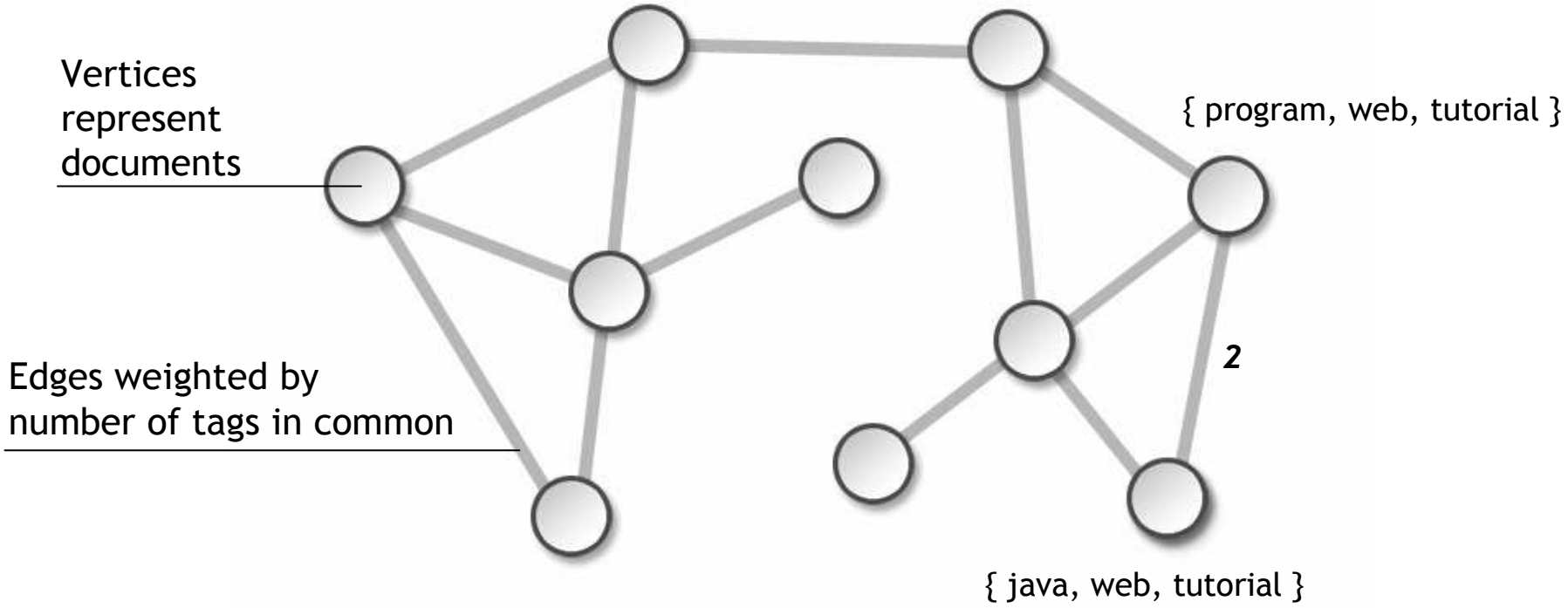
Personomies: data obtained by restricting F to a single user

$P_u = (T_u, D_u, A_u)$
$A_u = \{ (t,d) \mid (u,t,d) \in A \}$



Folksonomies and Personomies

- Personomies can be represented as a network



Analysis of Personomies

Objectives

- To understand the characteristics of personomies
- To study the diversity of user interests

Data

- 9,815 users from Delicious
  423 users from Bibsonomy
  8531 users from LibraryThing
- All associated tags and documents collected

Measuring Diversity of User Interests

Tag Utilisation

Measures the proportion of bookmarks a tag is assigned to. If tags are used on only a small portion of bookmarks, user interest should be more diversity.

Average Tag Co-occurrence Ratio

Measures the extent to which tags co-occur with each other. If tags are more frequently used with each other, they are more related. This also reflects the diversity of user interests.

Analysis of Personomies

Tag Utilisation

$$TagUtil(u) = \frac{1}{|T_u|} \sum_{t \in T_u} \frac{|D_{u,t}|}{|D_u|}$$

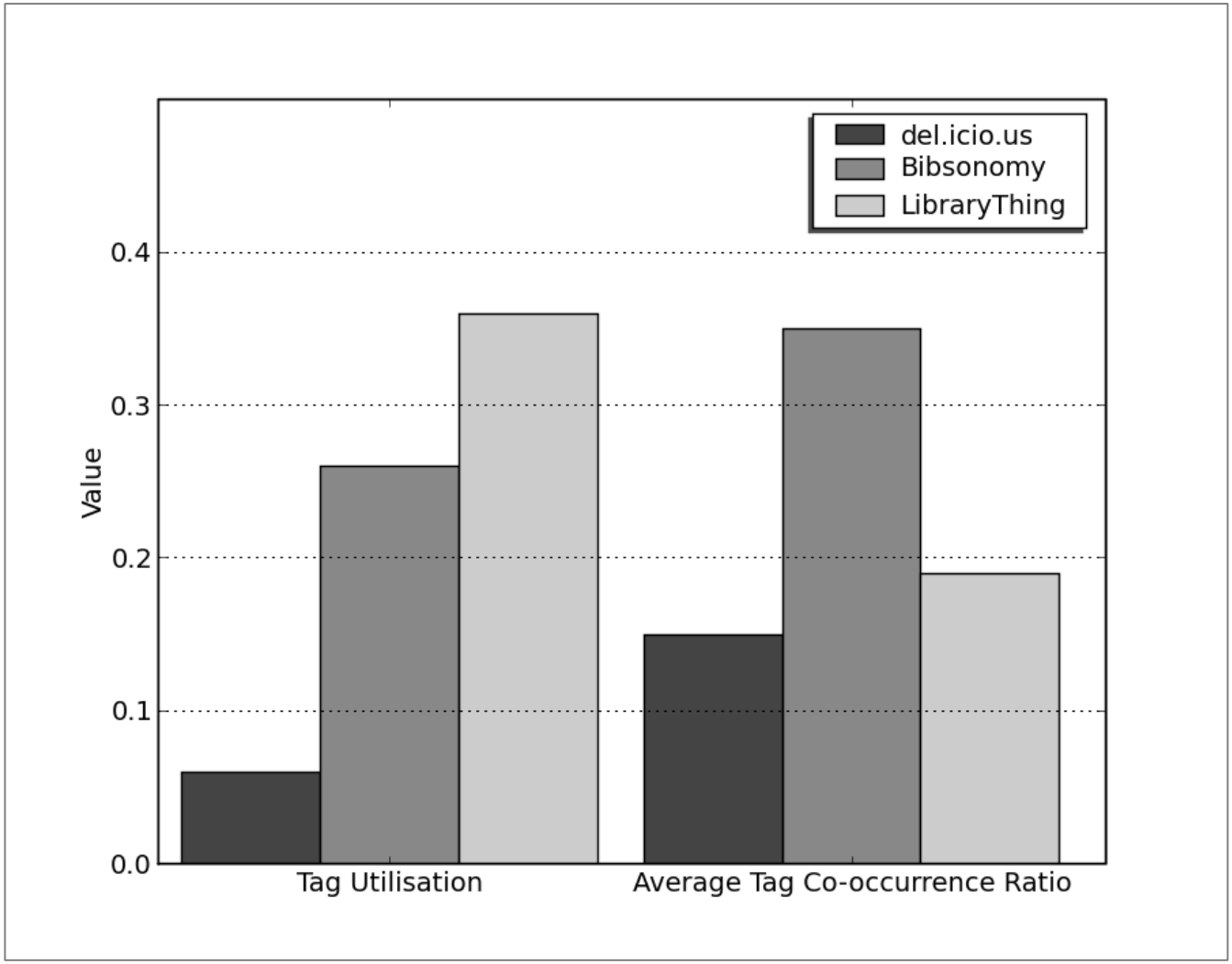
Average Tag Co-occurrence Ratio

$$Avg\_Tag\_Co(u) = \sum_{t_i, t_j \in T_u, t_i \neq t_j} \frac{Co(t_i, t_j)}{2 \times C_2^{|T_u|}}$$

- Example

User	BM	Tags	Measures
u_1	d_1	web2.0, semanticweb, ontology, notes	$TagUtil(u_1)$ = 0.60 $Avg\_Tag\_Co(u_1)$ = 0.80
	d_2	semanticweb, ontology	
	d_3	semanticweb, ontology, rdf	
u_2	d_4	semanticweb, folksonomy, tagging	$TagUtil(u_2)$ = 0.33 $Avg\_Tag\_Co(u_2)$ = 0.27
	d_5	toread, cooking, recipe, food	
	d_6	sports, football, news	

Analysis of Personomies

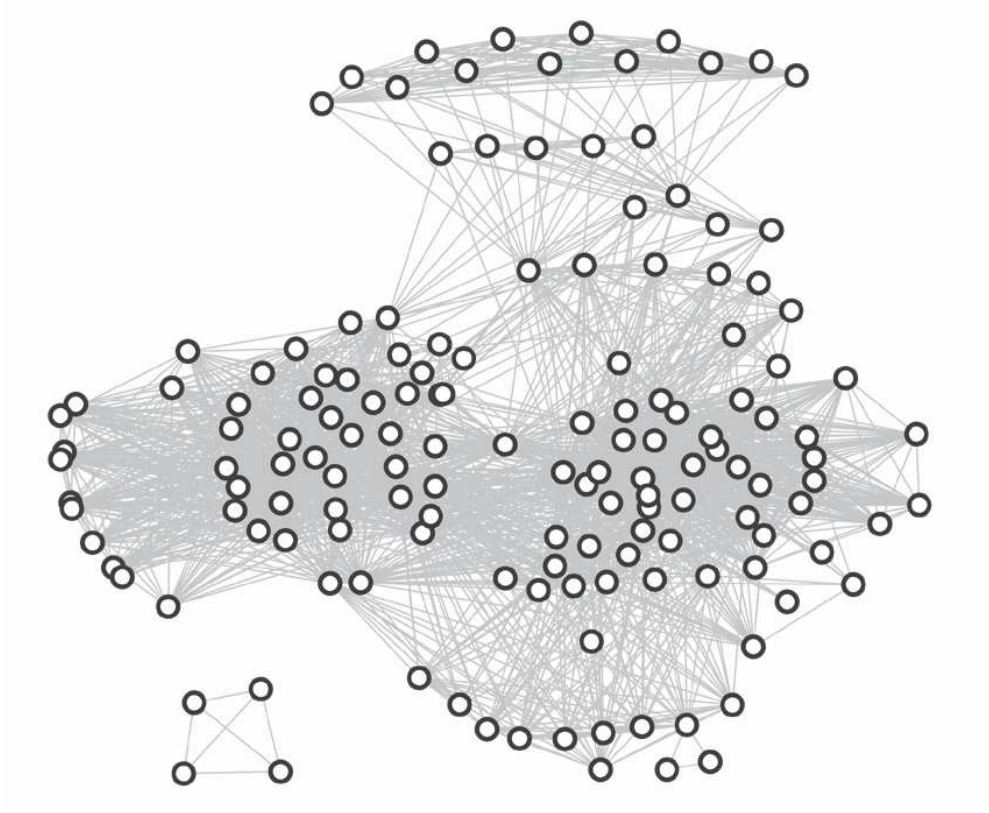


Constructing User Profiles

- User interests are very diverse, single term vectors not able to reflect such diversity
- How can we identify the interests of a user?
- Proposed method:
  1. Perform clustering of bookmarks of a user based on the tags assigned to them
  2. Extract tags from the clusters to represent the interests of the user

User Profiles

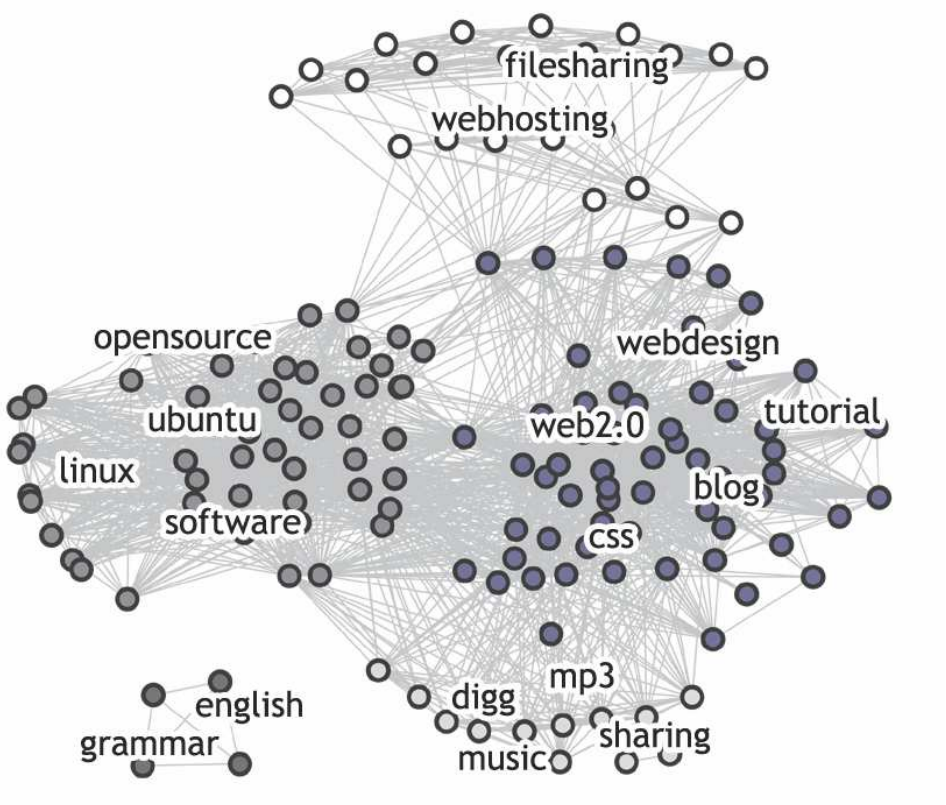
- Represent a personomy as a network of documents



- Nodes represent bookmarks of the user
- Edges are weighted by the number of common tags on the two bookmarks

User Profiles

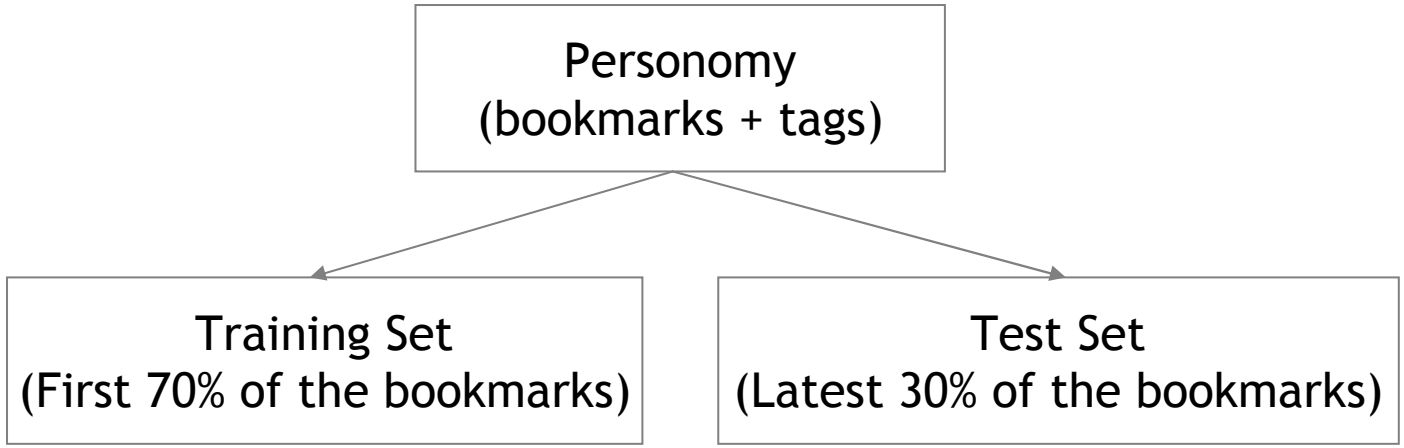
- Clustering by using the fast greedy algorithm for modularity optimisation



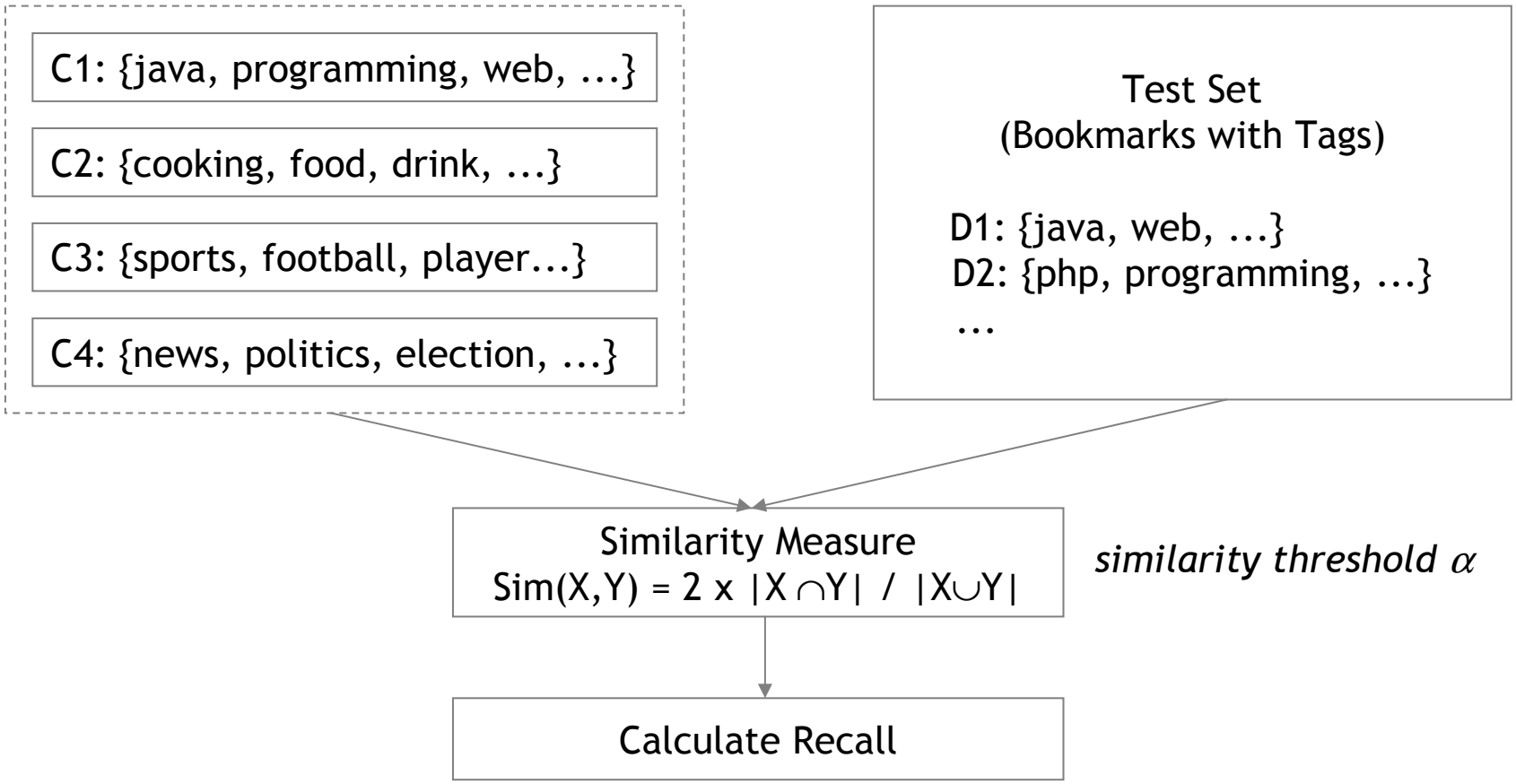
- For each cluster, extract a set of most frequently used tags *(the top f%)*
- The sets of tags act as a *signature* of the cluster
- They also represent the *multiple interests* of the user

Usefulness of the User Profiles

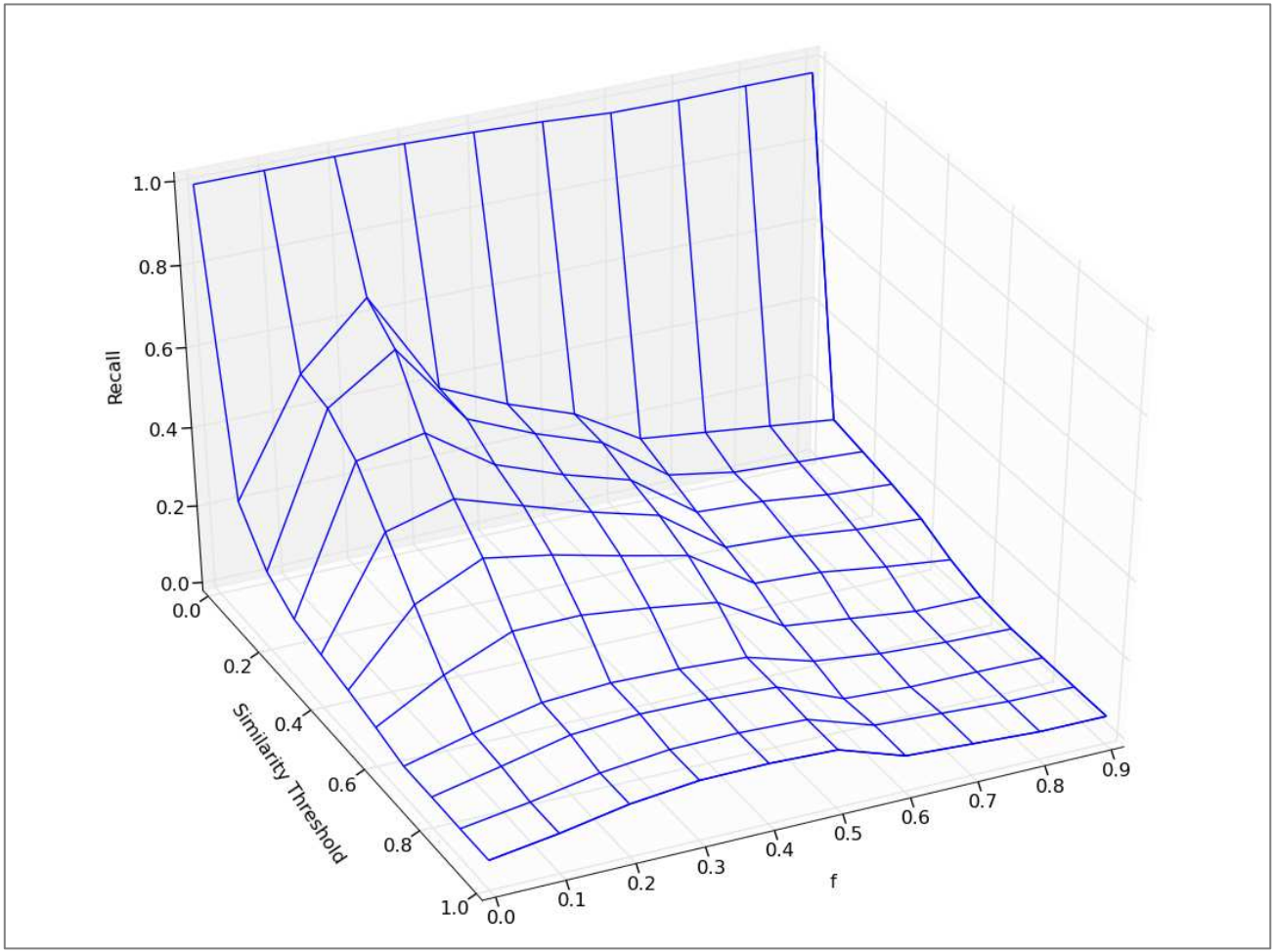
- Study whether the user profiles help the recommendation process
- With the Delicious dataset, we divide the personomy of a user into two sets:



Retrieving Bookmarks



Experiments and Discussions



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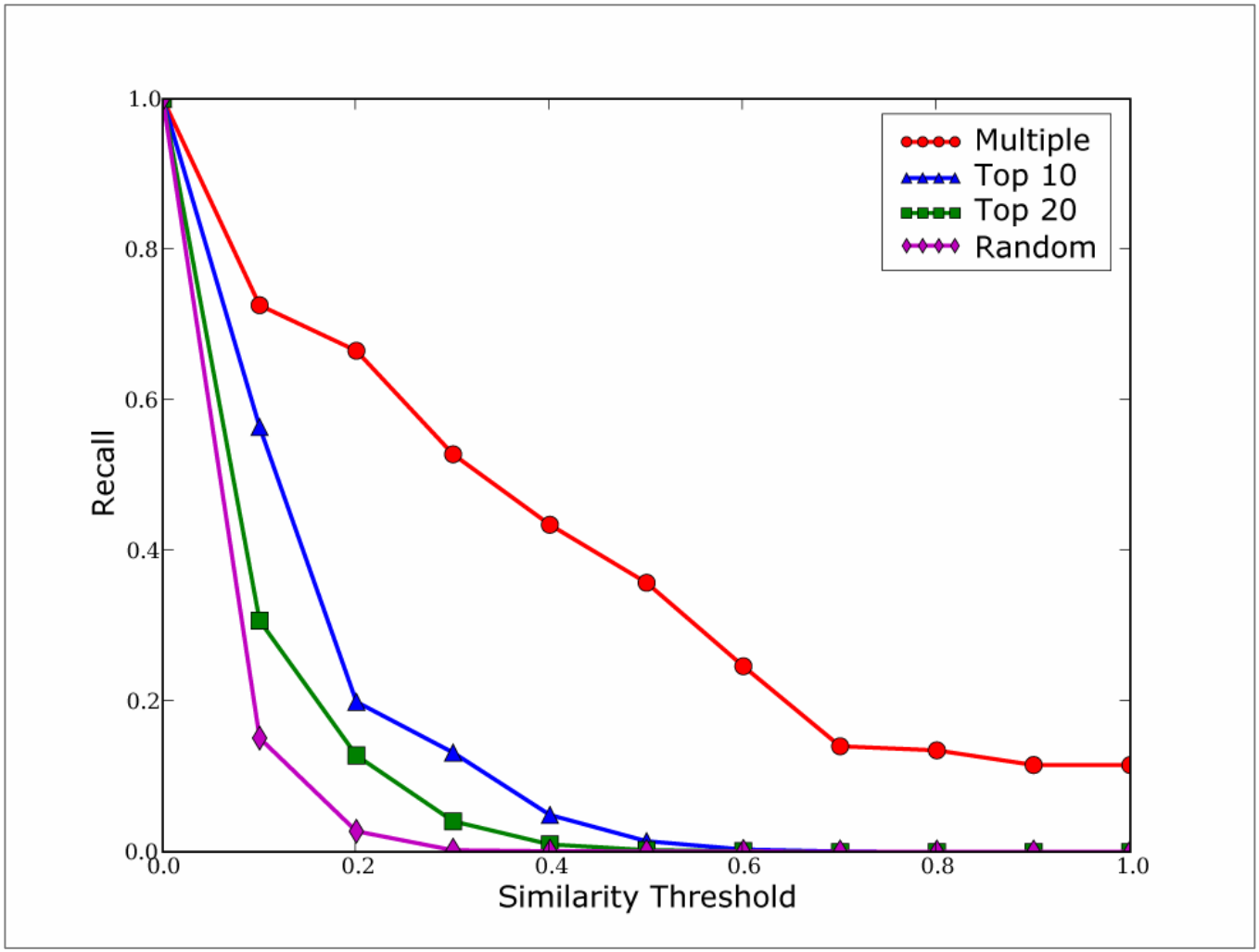

Summary

- The profiles generated are able to retrieve more relevant bookmarks at a particular threshold
- User profiles are more fine-grained, allow better judgement of the relevance of a document
- The clustering process produce meaningful clusters which represent the multiple interests of the users

Future Research Directions

- Use other clustering methods
- Introduce weights to the tags, distinguish between less and more important tags
- Study how the generated profiles can be used in a recommendation system

Thank You!

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