

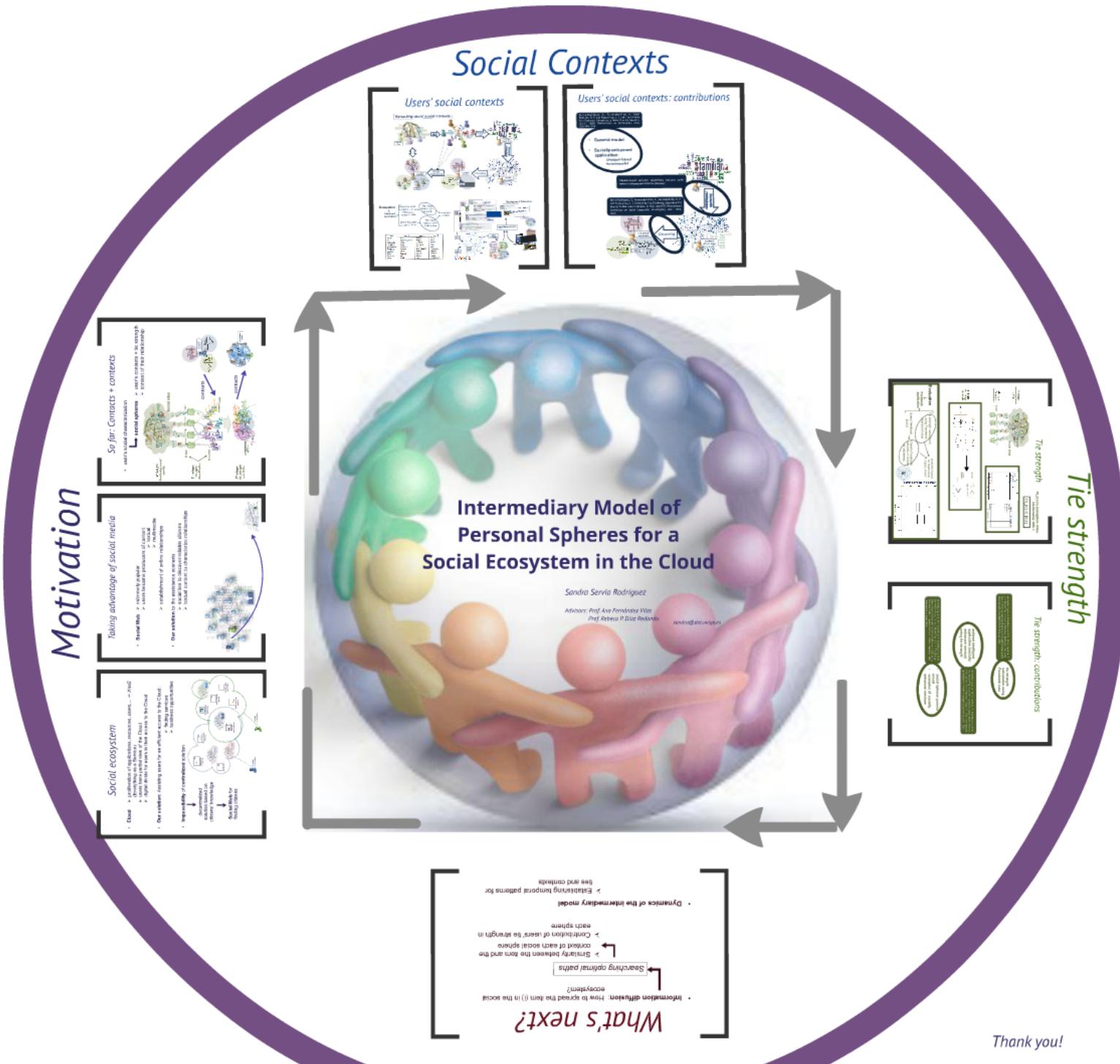
Thank you!

Intermediary Model of Personal Spheres for a Social Ecosystem in the Cloud

Sandra Servia Rodríguez

Advisors: Prof. Ana Fernández Vilas
Prof. Rebeca P. Díaz Redondo

sandra@det.uvigo.es



Thank you!

Motivation

Social ecosystem

- Cloud
 - proliferation of applications, resources, users,... -> XaaS (Everything as a Service)
 - users have partial view of the Cloud
 - digital divide for users in their access to the Cloud
- Our solution: Assisting users for an efficient access to the Cloud:
 - finding services
 - business opportunities

Impossibility of centralized solution

↓
decentralized
solution based on
citizens' knowledge
↓
Social Web for
finding citizens



Taking advantage of social media

- Social Web
 - extremely popular
 - users became producers of content
 - textual
 - multimedia
 - establishment of online relationships
- Our solution to the assistance scenario
 - social ties to discover reliable citizens
 - textual content to characterize relationships

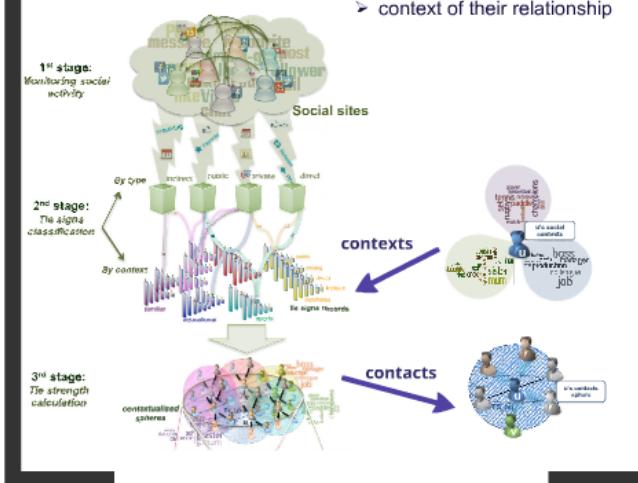


So far: Contacts + contexts

- user's social characterization

↳ **social spheres**

- user's contacts + tie strength
- context of their relationship

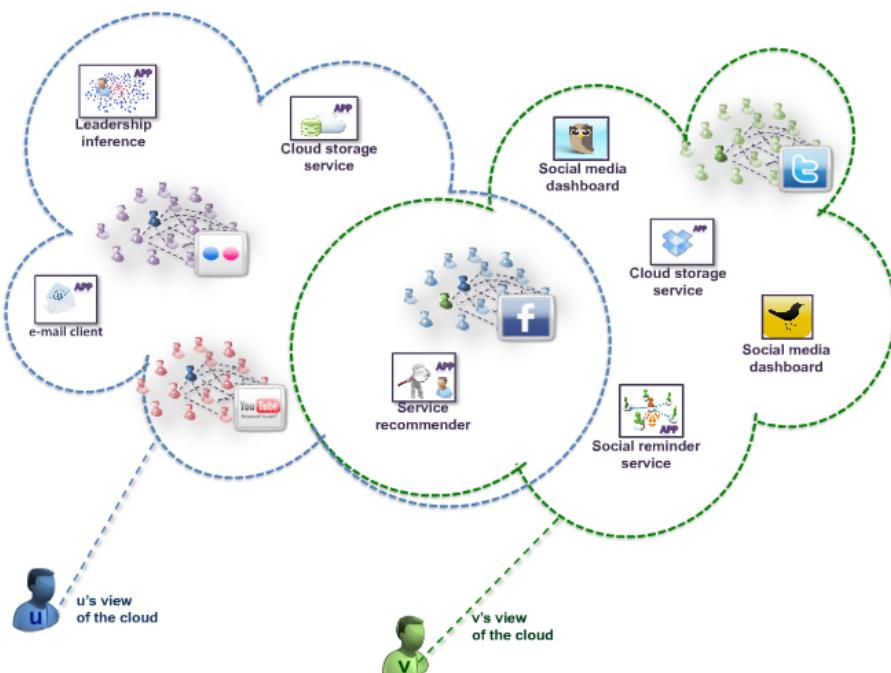


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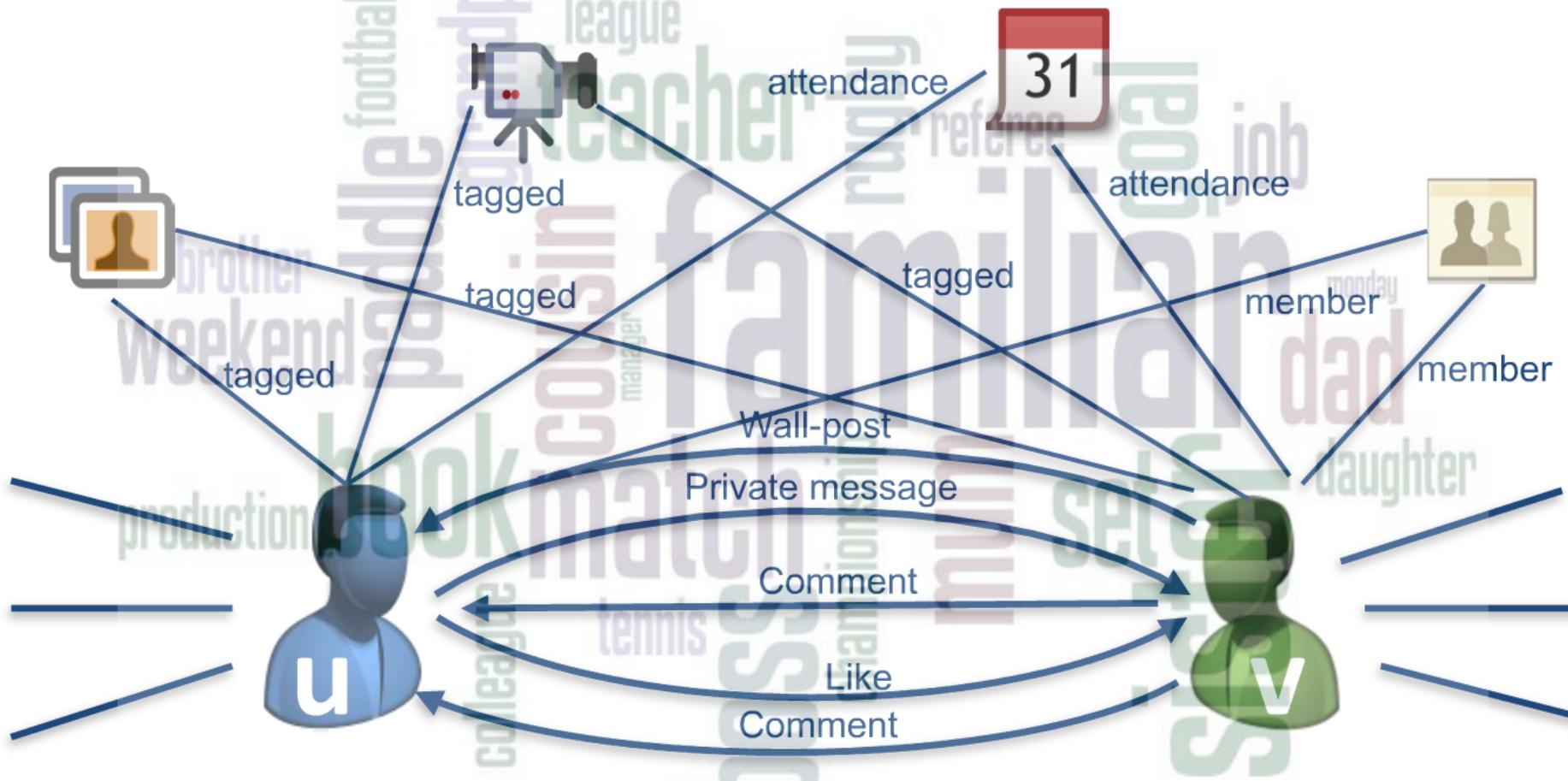


XaaS

ud:

unities



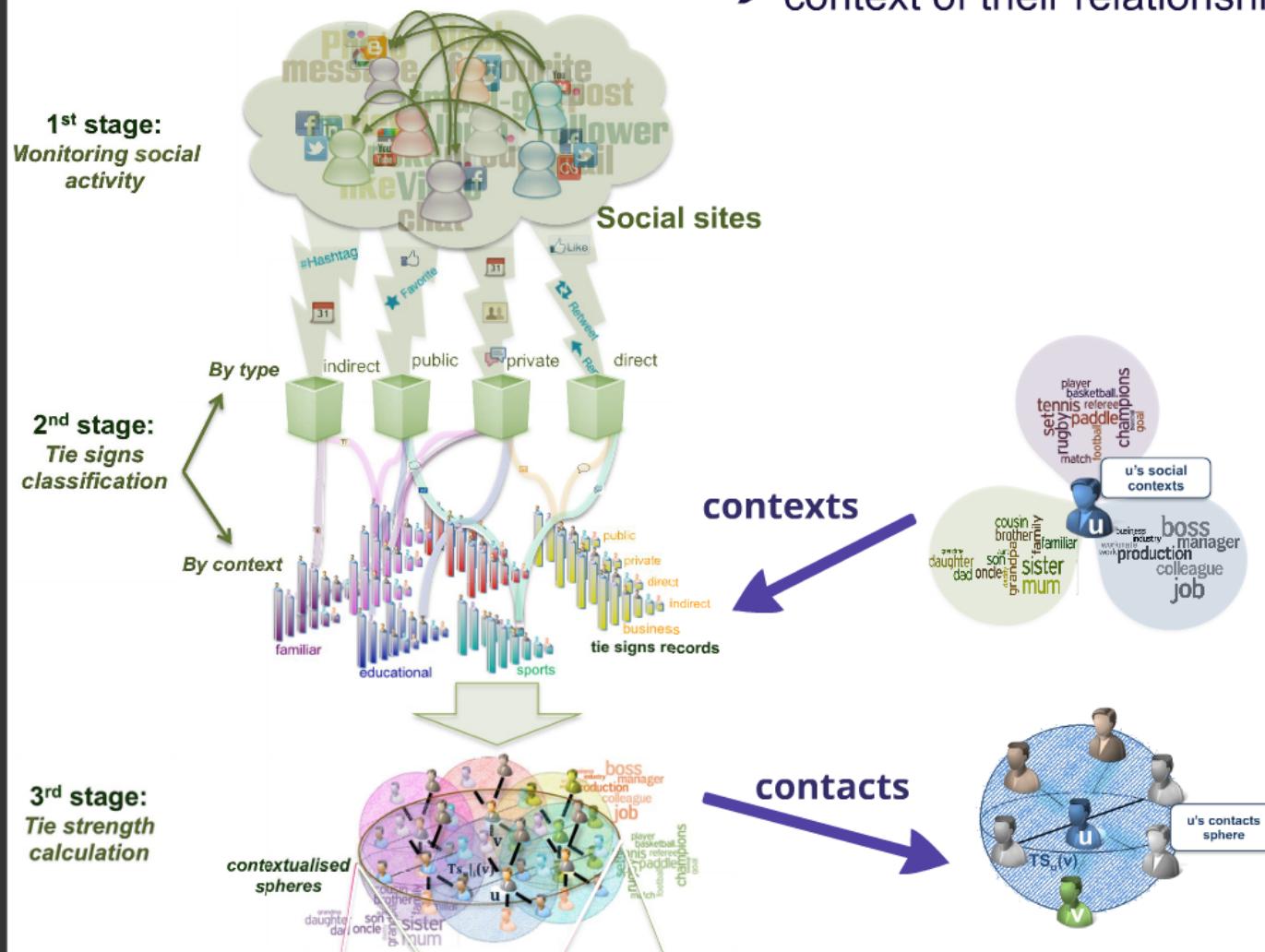


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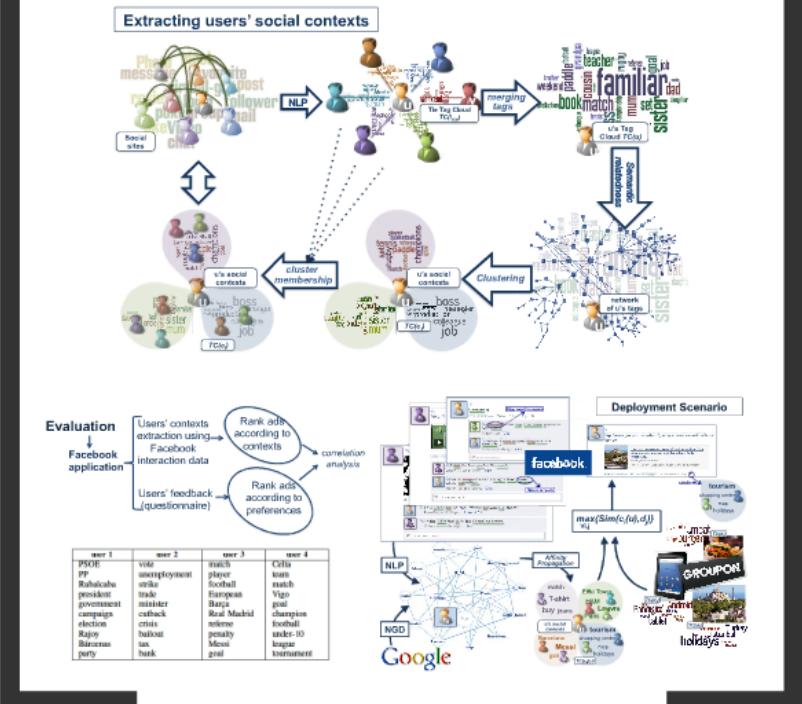
social spheres

- user's contacts + tie strength
 - context of their relationship

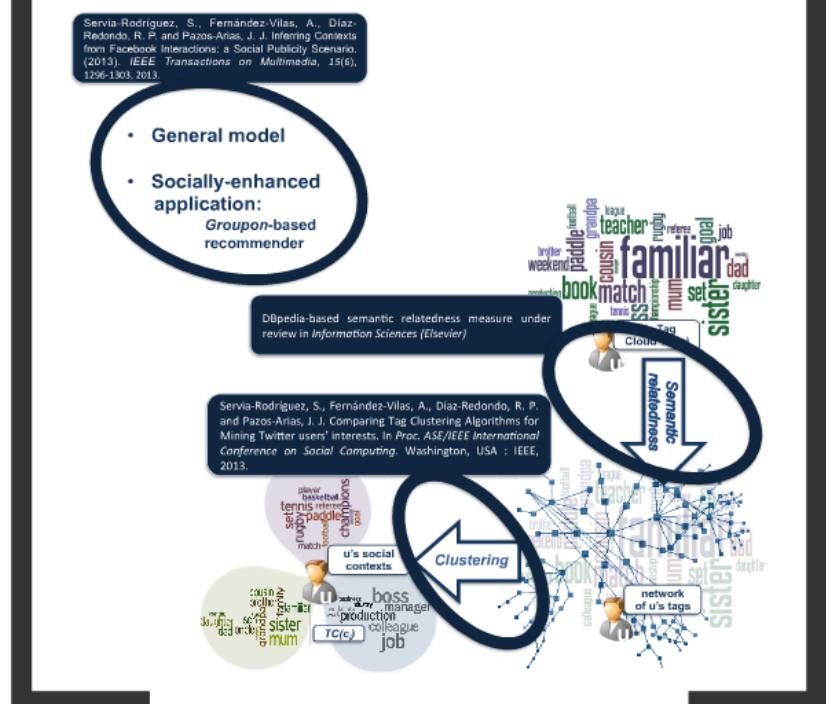


Social Contexts

Users' social contexts

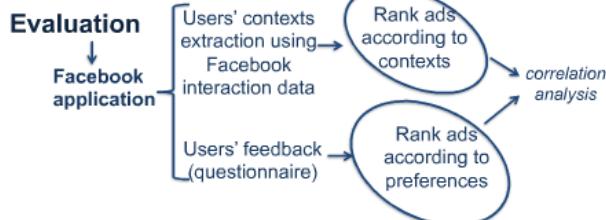
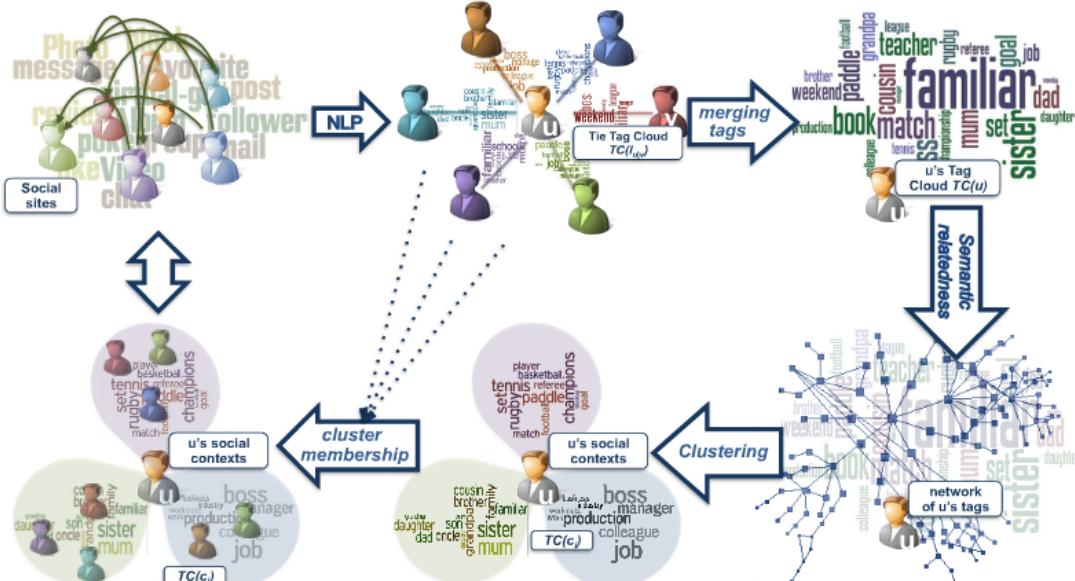


Users' social contexts: contributions

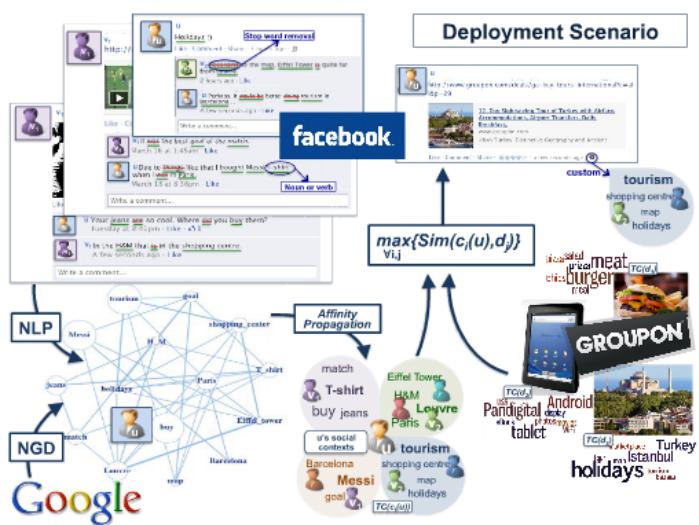


Users' social contexts

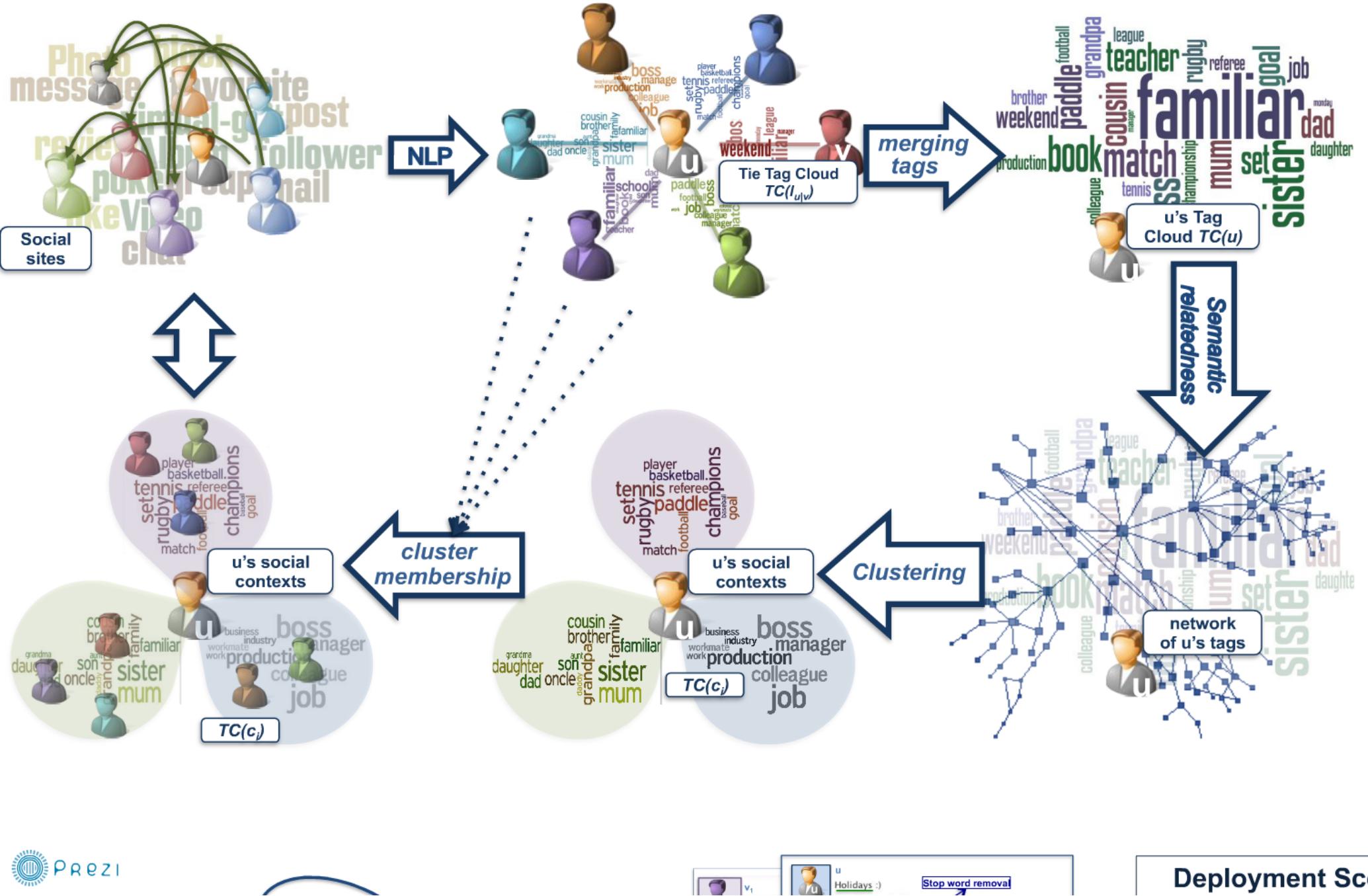
Extracting users' social contexts



user 1	user 2	user 3	user 4
PSOE	vote	match	Celta
PP	unemployment	player	team
Rubalcaba	strike	football	match
president	trade	European	Vigo
government	minister	Barça	goal
campaign	cutback	referee	champion
election	crisis	Messi	football
Rajoy	bailout	penalty	under-10
Bárcenas	tax	goal	league
party	bank		tournament



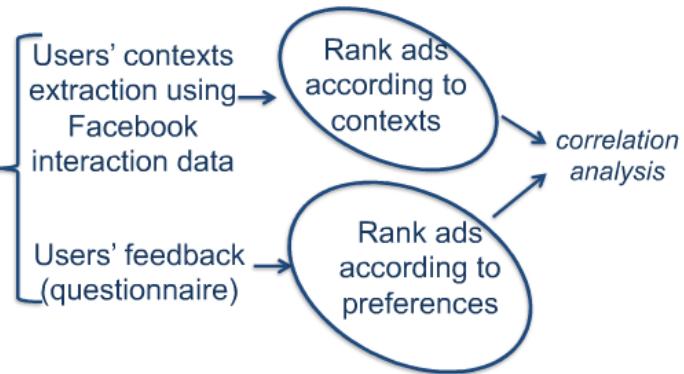
Extracting users' social contexts



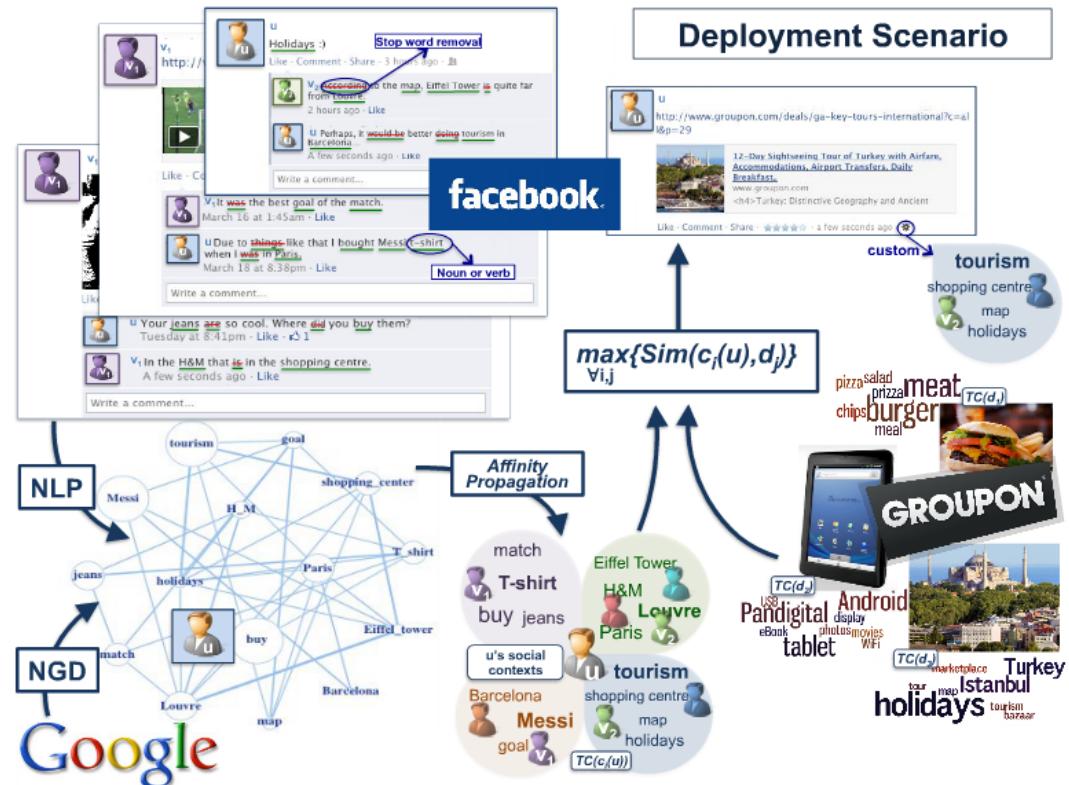


Evaluation

↓
Facebook application



user 1	user 2	user 3	user 4
PSOE	vote	match	Celta
PP	unemployment	player	team
Rubalcaba	strike	football	match
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Rajoy	bailout	penalty	under-10
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party	bank	goal	tournament



Users' social contexts: contributions

Servia-Rodríguez, S., Fernández-Vilas, A., Díaz-Redondo, R. P. and Pazos-Arias, J. J. Inferring Contexts from Facebook Interactions: a Social Publicity Scenario. (2013). *IEEE Transactions on Multimedia*, 15(6), 1296-1303, 2013.

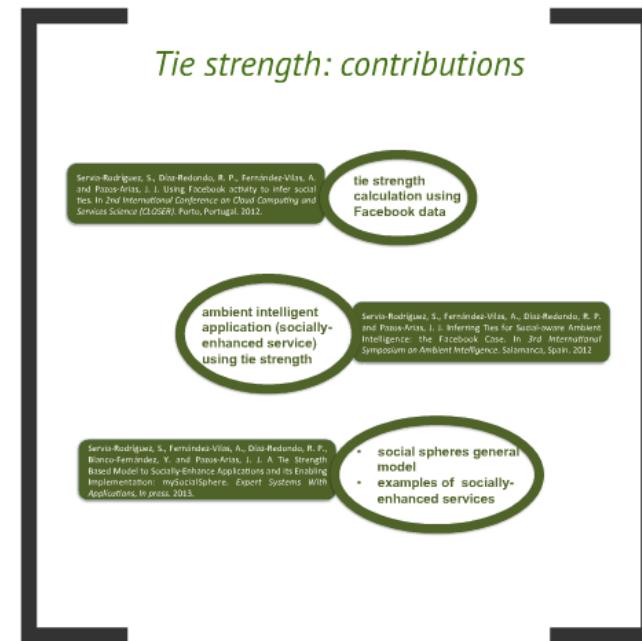
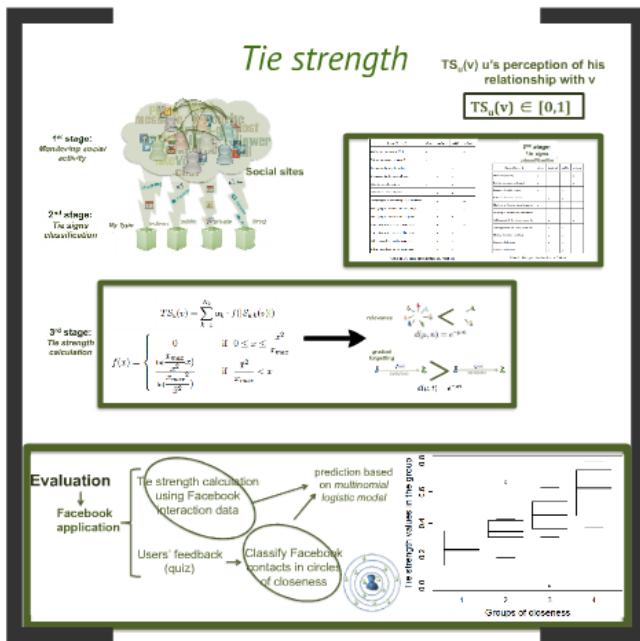
- General model
 - Socially-enhanced application:
Groupon-based recommender

DBpedia-based semantic relatedness measure under review in *Information Sciences (Elsevier)*

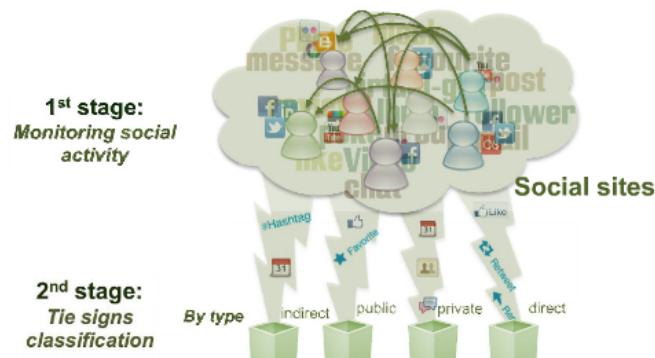
Servia-Rodríguez, S., Fernández-Vilas, A., Díaz-Redondo, R. P. and Pazos-Arias, J. J. Comparing Tag Clustering Algorithms for Mining Twitter users' interests. In *Proc. ASE/IEEE International Conference on Social Computing*. Washington, USA : IEEE, 2013.



Tie strength



Tie strength



$TS_u(v)$ u's perception of his relationship with v

$$TS_u(v) \in [0,1]$$

Sign ($S_{u k}(v)$)	direct	indirect	public	private
Wall posts in friend's Wall	x			y
Private message exchanged	x			x
Comments to friend's objects	x		x	
Comments in the same object	y	x		
Likes in friend's object	x		y	
Likes in the same object	x	x		
Being tagged in the same photo or video	x		x	
Belonging to the same private group	y	x		
Belonging to the same public group	x	y		
Attending to the same private event	x		x	
Attending to the same public event	x	x		
Being interested to the same user	y	x		
Being interested by the same user	x	y		

Table 1: Tie signs classification on Facebook

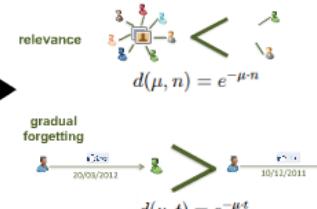
Sign ($S_{u k}(v)$)	direct	indirect	public	private
Message (posted)	x			x
Private message exchanged	x			y
Business friend's invite	x		x	
Accept the same friend's invite	x	x		
Making an favorite friend's invite	x		x	
Making an favorite the same invite	x	x		
Taking part of the private event	x		x	
Taking part of the same public event	x	x		
Sharing the same Hashtag	x	x		
Common Followers	x	x		
Common Following	x	y		

Table 2: Tie signs classification on Twitter

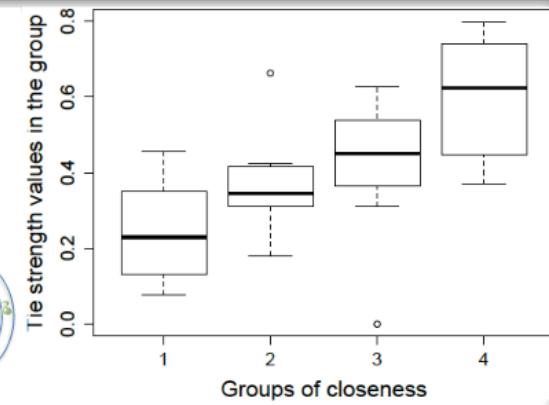
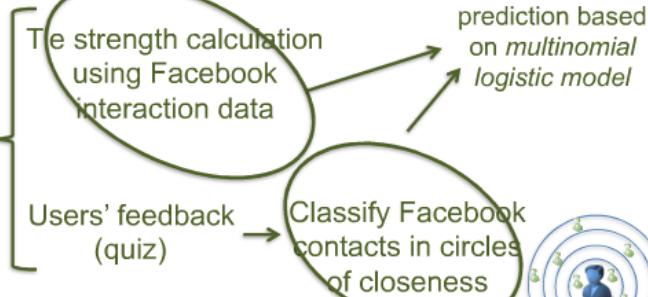
3rd stage:
Tie strength calculation

$$TS_u(v) = \sum_{k=1}^{N_k} \alpha_k \cdot f(|S_{u|k}(v)|)$$

$$f(x) = \begin{cases} 0 & \text{if } 0 \leq x \leq \frac{\bar{x}^2}{x_{max}} \\ \frac{\ln(\frac{x_{max}}{\bar{x}^2})x}{\ln(\frac{x_{max}^2}{\bar{x}^2})} & \text{if } \frac{\bar{x}^2}{x_{max}} < x \end{cases}$$



Evaluation
↓
Facebook application



$$TS_u(v) \in [0,1]$$

Signs ($S_{u k}(v)$)	<i>direct</i>	<i>indirect</i>	<i>public</i>	<i>private</i>
Wall-posts in friend's Wall	x			x
Private messages exchanged	x			x
Comments in friend's objects	x		x	
Comments in the same objects		x	x	
Likes in friend's objects	x		x	
Likes in the same objects		x	x	
Being tagged in the same photos or videos		x		x
Belonging to the same private group		x		x
Belonging to the same public group		x	x	
Attending to the same private event		x		x
Attending to the same public event		x	x	
Being subscribed to the same user		x	x	
Being subscribed by the same user		x	x	

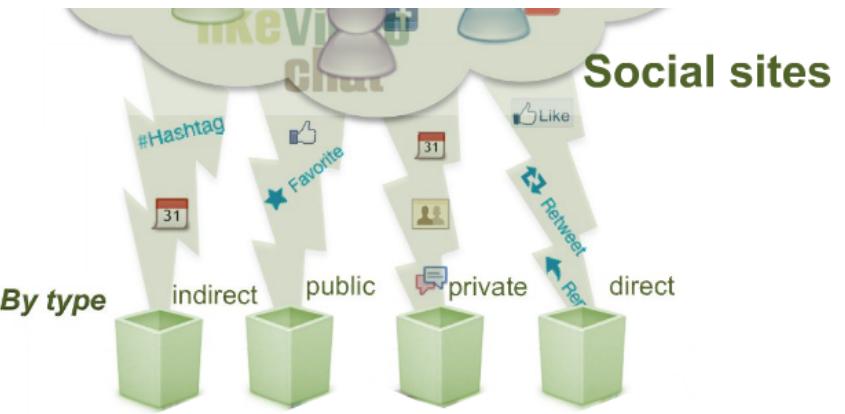
Table 1: Tie signs classification on Facebook

2nd stage: *Tie signs classification*

Signs ($S_{u k}(v)$)	<i>direct</i>	<i>indirect</i>	<i>public</i>	<i>private</i>
Mentions (replies)	x			x
Private messages exchanged	x			x
Retweets friend's tweets	x		x	
Retweets the same tweets		x	x	
Marking as favorite friend's tweets	x		x	
Marking as favorite the same tweets		x	x	
Taking part of the private same list		x		x
Taking part of the same public list		x	x	
Sharing the same Hashtag		x	x	
Common Followers		x	x	
Common Followees		x	x	

Table 2: Tie signs classification on Twitter

activity



Social sites

2nd stage: Tie signs classification

Private messages exchanged	x			x
Comments in friend's objects	x		x	
Comments in the same objects		x	x	
Likes in friend's objects	x		x	
Likes in the same objects		x	x	
Being tagged in the same photos or videos		x		x
Belonging to the same private group		x		x
Belonging to the same public group		x	x	
Attending to the same private event	x		x	
Attending to the same public event	x	x		
Being subscribed to the same user	x	x		
Being subscribed by the same user	x	x		

Table 1: Tie signs classification on Facebook

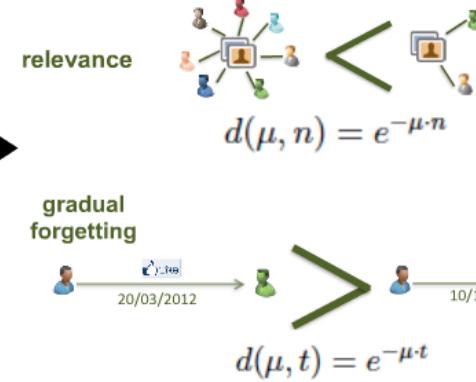
Signs ($S_{n,k}(v)$)
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Common Followers
Common Followers

Table 2: Tie signs

3rd stage: Tie strength calculation

$$TS_u(v) = \sum_{k=1}^{N_k} \alpha_k \cdot f(|S_{u|k}(v)|)$$

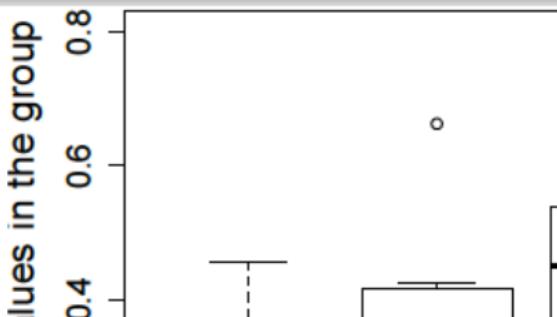
$$f(x) = \begin{cases} 0 & \text{if } 0 \leq x \leq \frac{\bar{x}^2}{x_{max}} \\ \frac{\ln(\frac{x_{max}}{\bar{x}^2}x)}{\ln(\frac{x_{max}}{\bar{x}^2})} & \text{if } \frac{\bar{x}^2}{x_{max}} < x \end{cases}$$



valuation
↓
Facebook
application

Tie strength calculation
using Facebook
interaction data

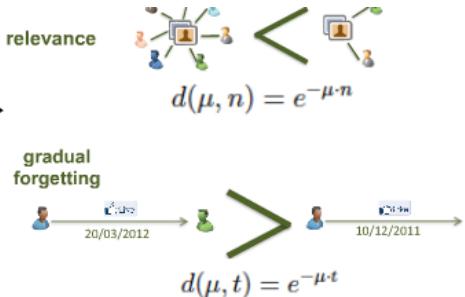
prediction based
on *multinomial logistic model*



3rd stage: Tie strength calculation

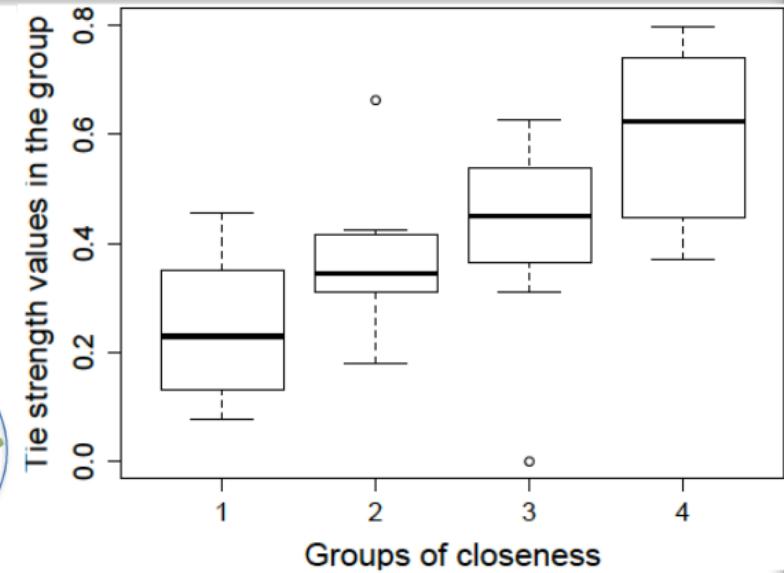
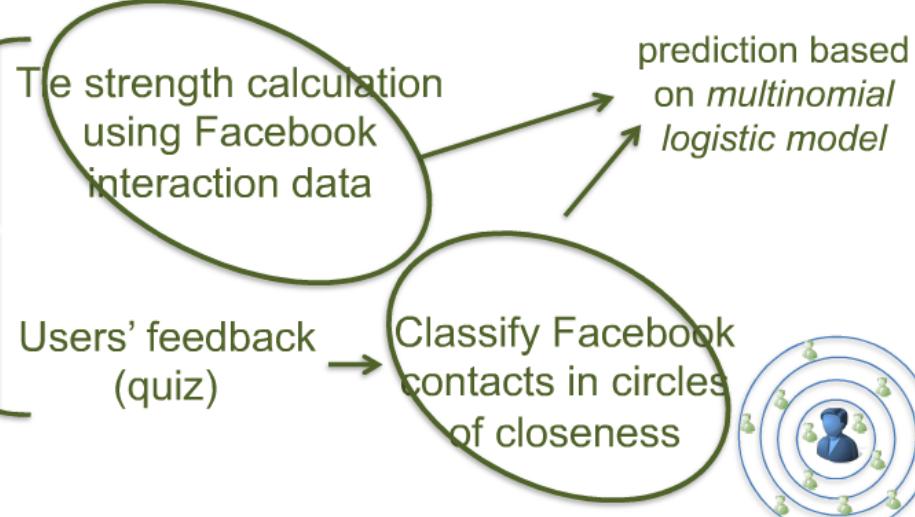
$$TS_u(v) = \sum_{k=1}^r \alpha_k \cdot f(|S_{u|k}(v)|)$$

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Evaluation

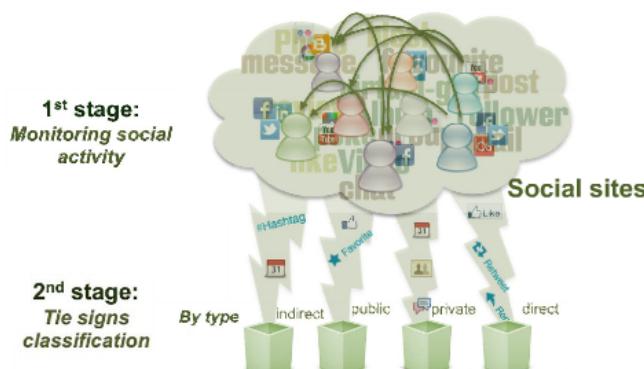
↓
Facebook application



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2nd stage: Tie signs classification

Sign ($S_{u k}$)	direct	indirect	public	private
Wall post or reply Wall	x		x	
Private message exchanged	x			x
Comments by friends objects	x	x		
Likes in friends objects	x	x		
Likes in the user objects	x	x		
Retweeting or like the user objects	x		x	
Retweeting or like the user's friends objects	x		x	
Retweeting or like the user's friends' friends objects	x		x	
Retweeting or like the user's friends' friends' friends objects	x		x	
Commenting to the user's public event	x	x		
Attending to the user's public event	x	x		
Being mentioned to the user's event	x	x		
Being mentioned to the user's friend's event	x	x		
Being mentioned to the user's friend's friend's event	x	x		
Being mentioned to the user's friend's friend's friend's event	x	x		
Being mentioned to the user's friend's friend's friend's friend's event	x	x		

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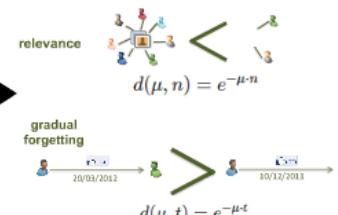
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Message (reply)	x			x
Private message exchanged	x		x	
Retweets friend's friends	x		x	
Retweets the user's friends	x		x	
Mention or favorite friend's friends	x		x	
Mention or favorite the user's friends	x		x	
Taking part of the private status list	x		x	
Sharing the user's public list	x	x		
Sharing the user's listing	x	x		
Comments Followers	x	x		
Comments Followers	x	x		

Table 2: Tie signs classification on Twitter

3rd stage:
Tie strength
calculation

$$TS_u(v) = \sum_{k=1}^{N_k} \alpha_k \cdot f(|S_{u|k}(v)|)$$

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Evaluation

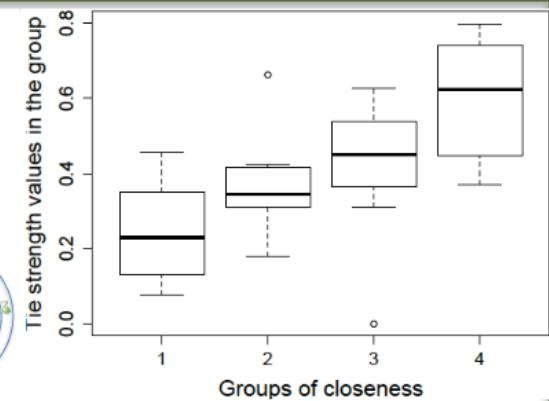
↓
Facebook application

Tie strength calculation using Facebook interaction data

Users' feedback (quiz)

prediction based on multinomial logistic model

Classify Facebook contacts in circles of closeness



Tie strength: contributions

Servia-Rodríguez, S., Díaz-Redondo, R. P., Fernández-Vilas, A. and Pazos-Arias, J. J. Using Facebook activity to infer social ties. In *2nd International Conference on Cloud Computing and Services Science (CLOSER)*. Porto, Portugal. 2012.

**tie strength
calculation using
Facebook data**

**ambient intelligent
application (socially-
enhanced service)
using tie strength**

Servia-Rodríguez, S., Fernández-Vilas, A., Díaz-Redondo, R. P. and Pazos-Arias, J. J. Inferring Ties for Social-aware Ambient Intelligence: the Facebook Case. In *3rd International Symposium on Ambient Intelligence*. Salamanca, Spain. 2012

Servia-Rodríguez, S., Fernández-Vilas, A., Díaz-Redondo, R. P., Blanco-Fernández, Y. and Pazos-Arias, J. J. A Tie Strength Based Model to Socially-Enhance Applications and its Enabling Implementation: mySocialSphere. *Expert Systems With Applications*, *In press*. 2013.

- **social spheres general model**
- **examples of socially- enhanced services**

What's next?

- **Information diffusion:** How to spread the item (i) in the social ecosystem?



Searching optimal paths

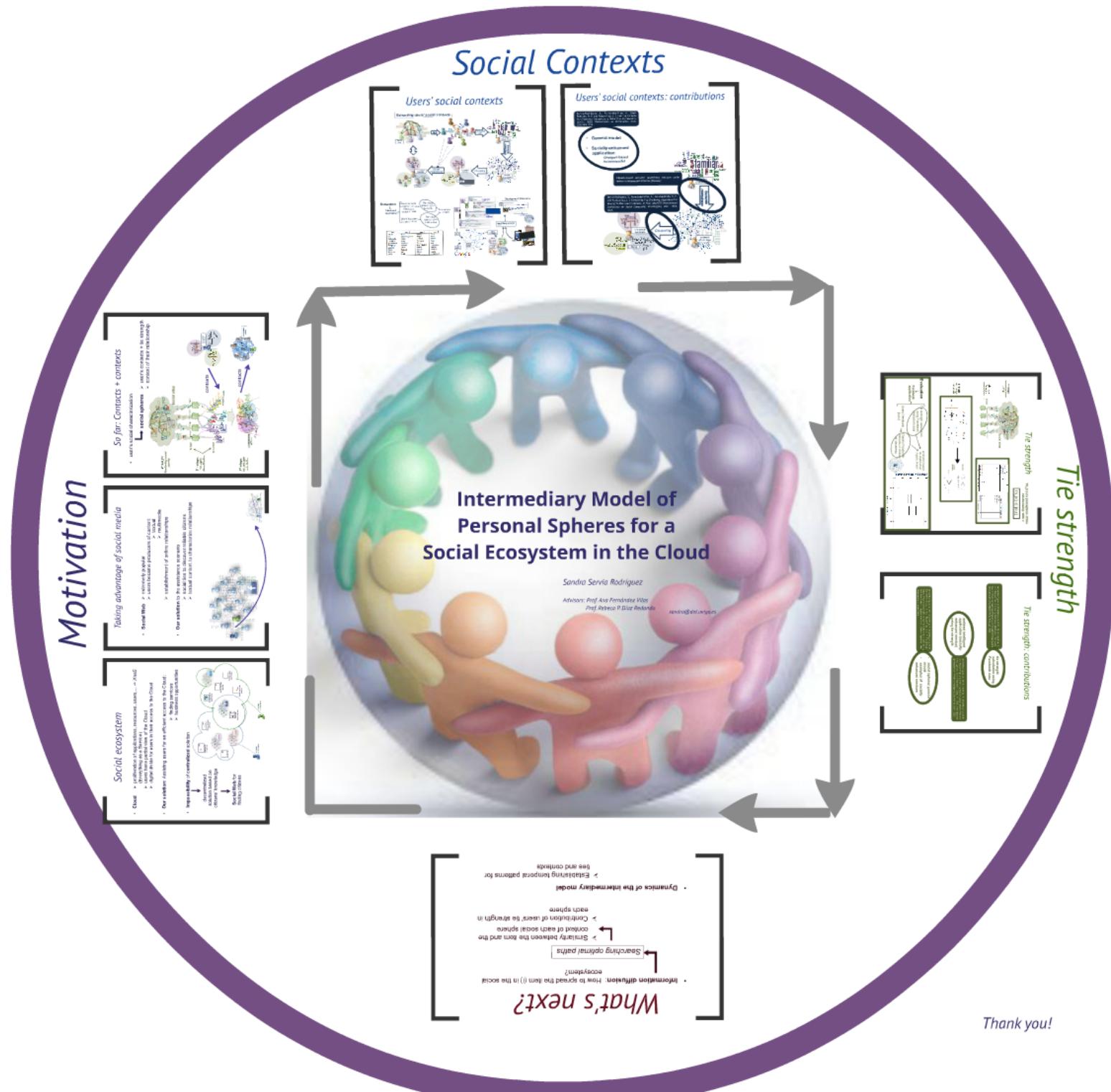


- Similarity between the item and the context of each social sphere
- Contribution of users' tie strength in each sphere

- **Dynamics of the intermediary model**

- Establishing temporal patterns for ties and contexts

Thank you!



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