Using Text Similarity to Detect Social Interactions not Captured by Formal Reply Mechanisms

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Users' reactions

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- Common prediction task: is this particular user going to reply to this message?
  - A dual problem: this user created a message. Is it a reaction to some received message?

- Users might generate content as reaction to received messages
  - Reply mechanisms help to capture part of these reactions
    - Twitter Replies and Retweets and Facebook Likes and Shares
  - What are we missing?

- Research questions
  - Do explicit responses in fact tend to have high text similarity?
  - What is the potential of text similarity to find non-explicit responses?
  - What is the nature of the reactions captured by text similarity?
  - Are many users "invisible" because they do not use formal replies mechanisms but still react to the content they see?

The Proposed Approach

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1. Reconstruct the ego-user's timeline at the moment he generated each of his messages
   - Ego-networks are suitable since they encompass all messages a user send and receive
   - Easy to be done in reverse-chronological ordered timelines
2. Look in the ego-user's timeline for similar messages to the one that was generated
   - A nomalized version of Tf-Idf scoring

- Our data
  - 449 Twitter users' ego-networks, including the messages generate by each user
  - The dataset was crawled in the first three weeks of December, 2012, users are Obama's followers originally crawled for a diffusion study on the presidential campaign
  - Filtered users that:
    - did not choose English as their profile language
    - did not posted in the last month previous to the crawling
    - the followee crawling did not provide at least 80% of overlapping activity

Timeline reconstruction

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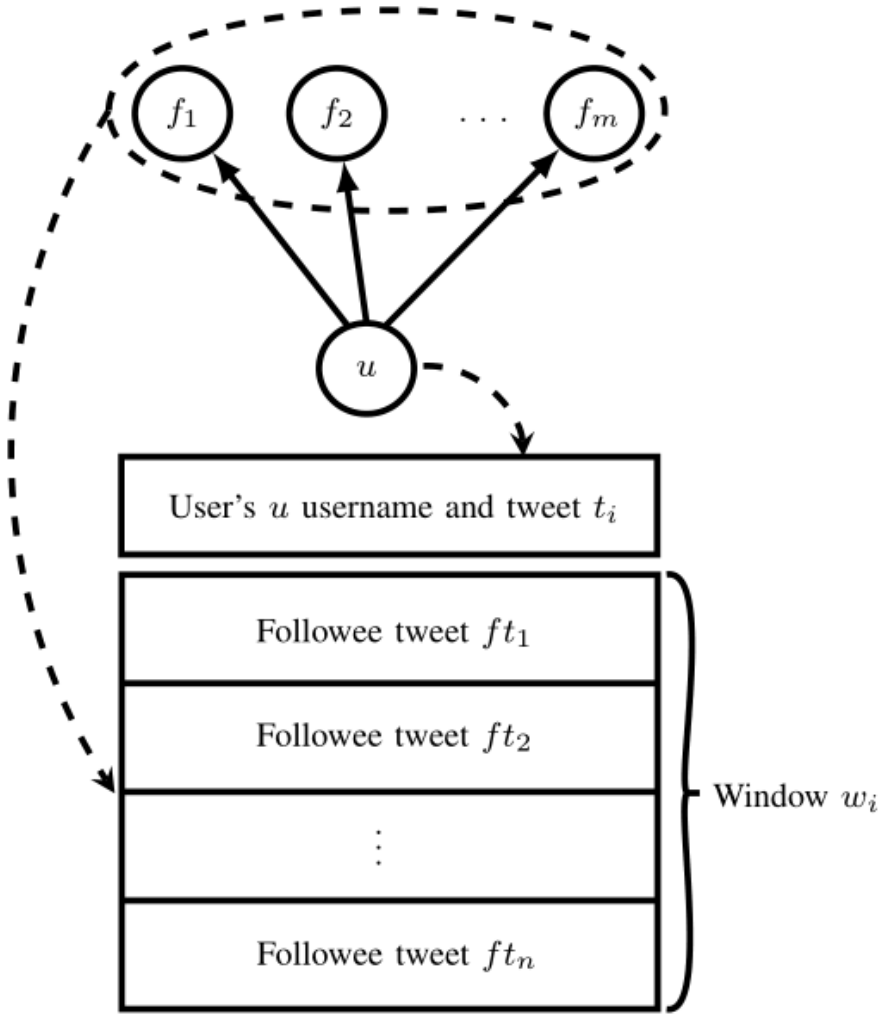
- One window for each message
- For messages that are Replies, 80%+ of the messages they reply to are in the last 100 tweets (Comarela et al.)

Replies	4192	82%
Replies in windows	3455	



Similarity Evaluation

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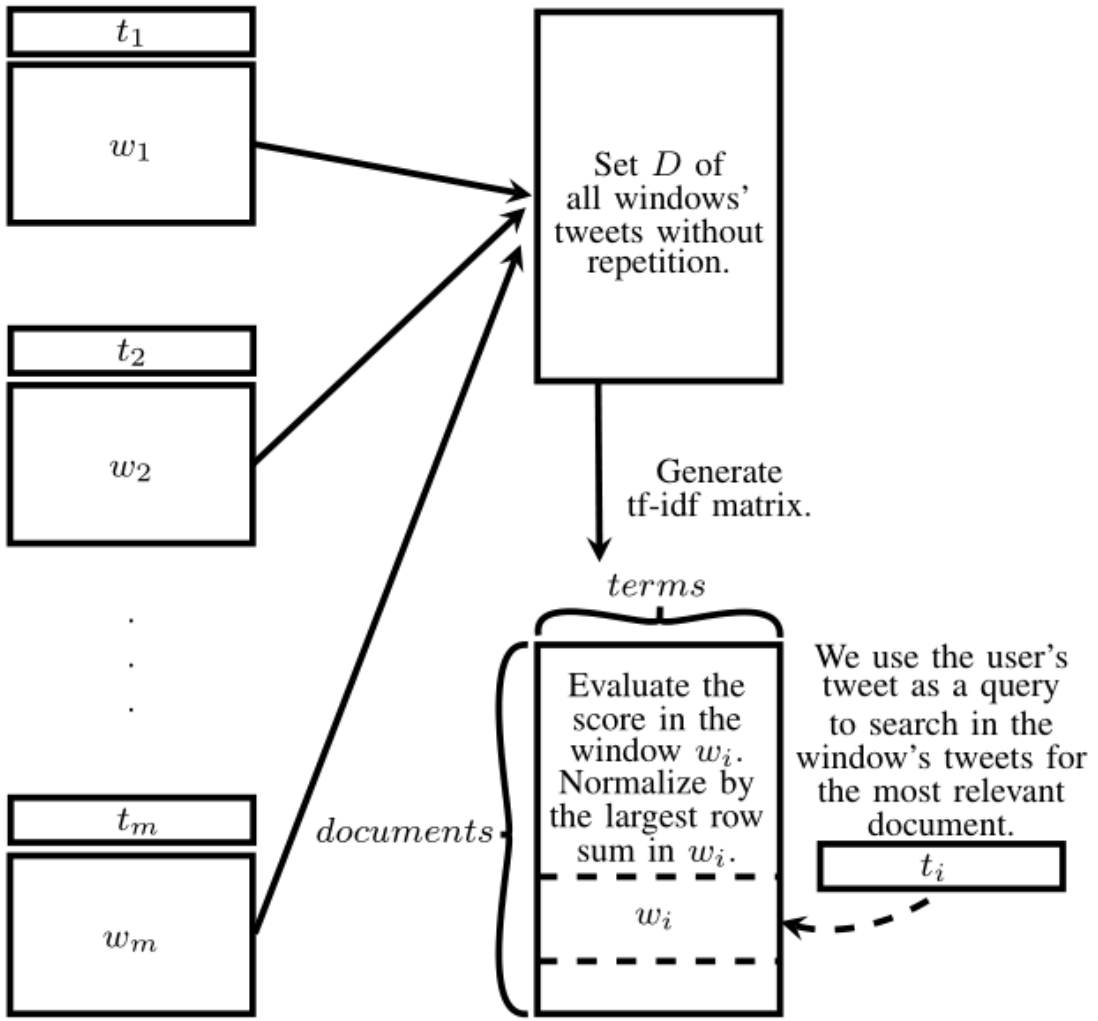
- Tf-idf transformation on the union of all the windows of one user
- Each message is used as a query to search in the associated rows in the final matrix
- The result is normalized by the largest possible score for a given window, i.e., the largest row sum for each window



Looking for missed reactions

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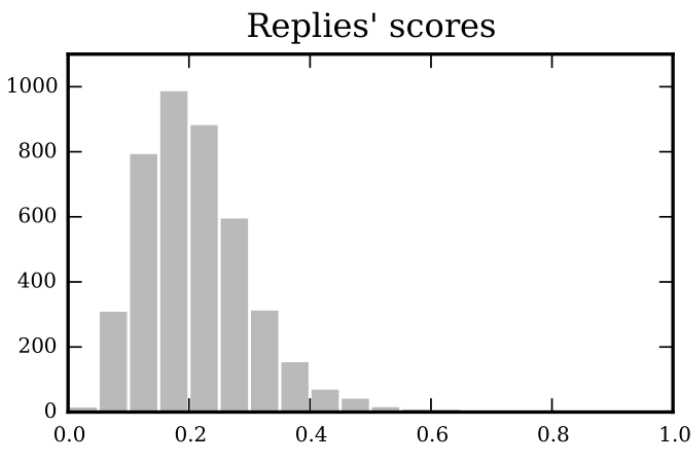
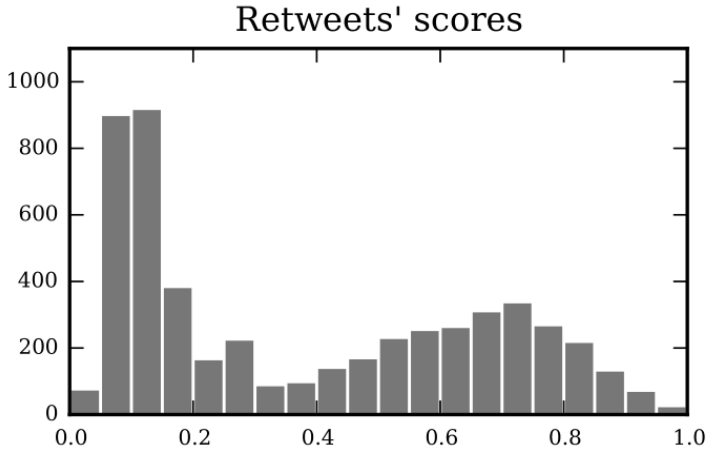
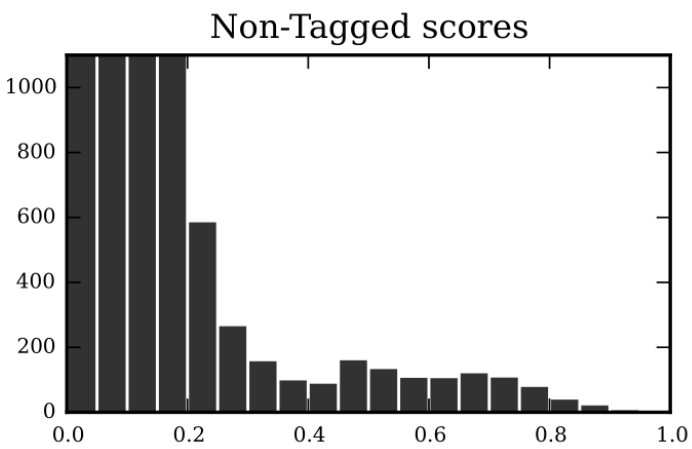
Do explicit responses in fact tend to have high text similarity?







Considering a conservative cutoff

	Mean	Median	Std.
Non-Tagged	0.135	0.102	0.136
Replies	0.212	0.200	0.092
Retweets	0.384	0.287	0.282

What is the potential of text similarity to find non-explicit responses?

	Non-Tagged	Replies	Retweets	
High Scored (score ≥ 0.384)	998	177	2408	11%
Total	16650	4192	5209	

What is the nature of these reactions?

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- Retweets
  - High scored presents the same content
  - Score drops with the size, even with the same content
  - Low scored have the RT marker but weren't found in windows
- Replies
  - High scored look like retweets or multiple mentions in a conversation
  - @-mentions seem to be the main evidence for similarity
- Non-Tagged
  - High scored look like retweets
  - Users may be independently retweeting the same content
  - Usually have small comments
  - As the score goes down, looks less like a retweet, but often topically related, e.g., same hashtags

avidAmejia: RT @Snoopy: It's Monday, noopy! http://t.co/asOF9yPA

shKetchum151: Mondays are like Zubats. obody likes Zubats.

Serrae: @MollytheGhost @PhantomRat @hollye83 @hockeybychoice @onlymystory @sjopierce @phouse1964 Hate them.

hollye83: @hockeybychoice @onlymystory @PhantomRat @sjopierce @phouse1964 @MollytheGhost @Serrae Hateful. Just hateful.

Zac_Hartlage14: @BadJerry20 OKC traded James Harden

24_Jag: Why WOULD OKC TRADE JAMES HARDEN????

The users we are missing

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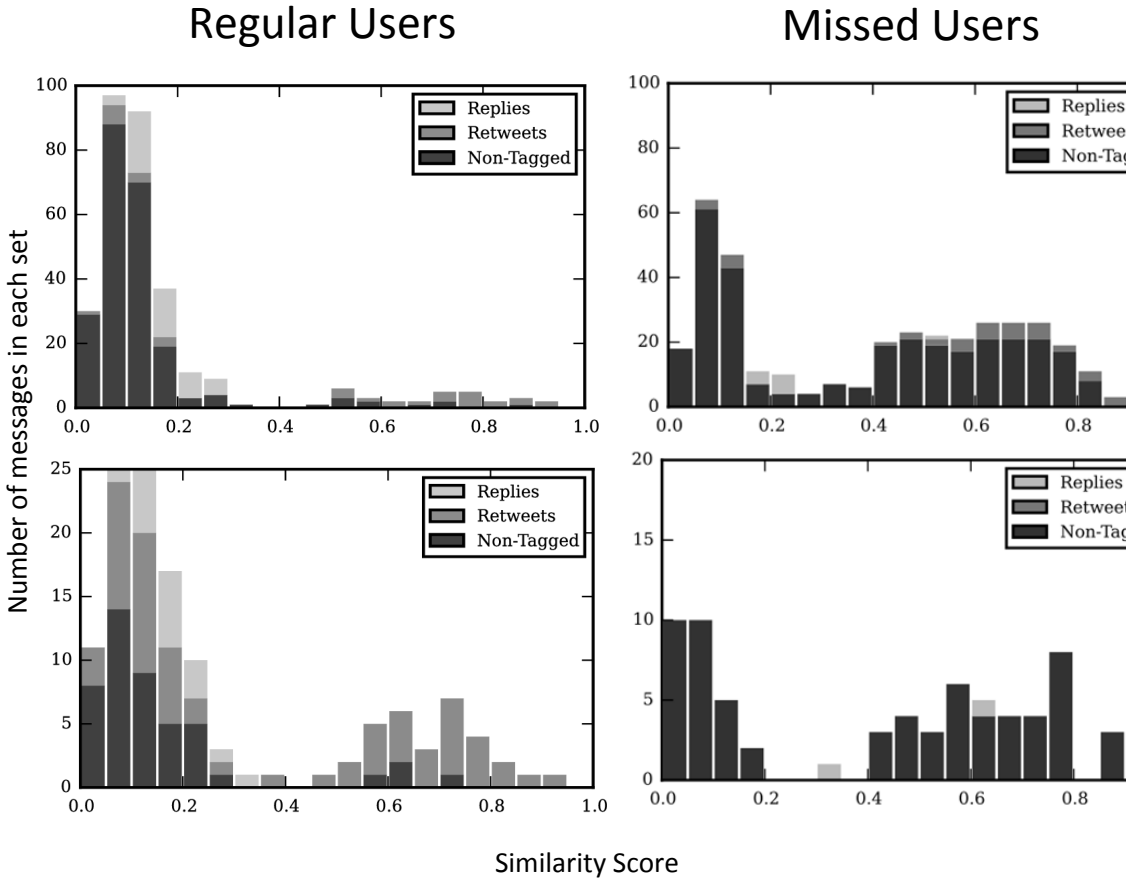
- 149 out of 449 (29%) users generated high scoring non-tagged messages
- There are users who consistently generate high scored messages belonging to all ranges of level of activity

Individual Users' distributions



More on how we are missing users

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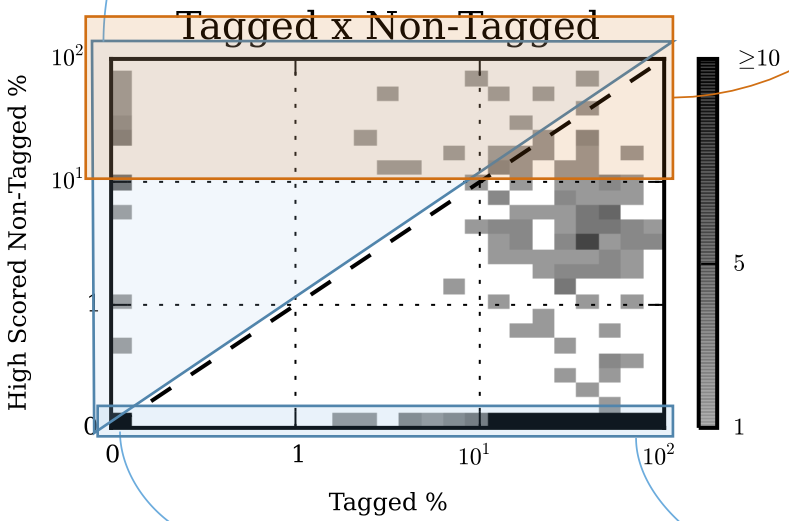
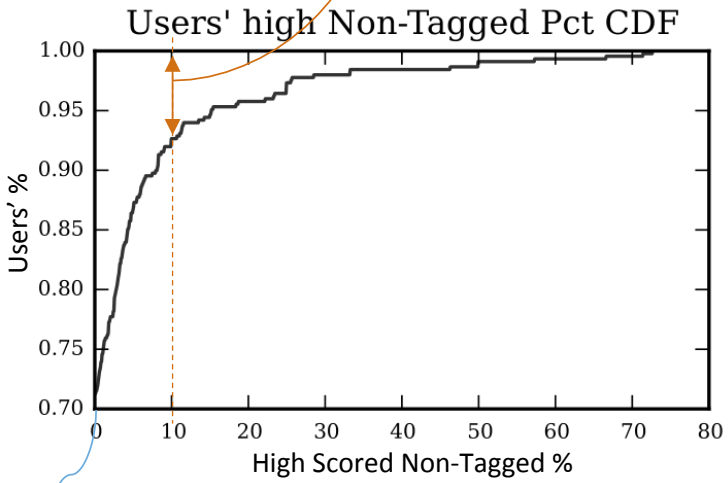
6% of the users generated more high scored messages than formal replies



8% of the users had a high score attributed to at least 10% of their messages



24% of the users did not use formal reply mechanisms nor generated high scored messages

71% of the user only used formal reply mechanisms with no high scored messages

Wrapping it up

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- Considering a conservative cutoff
  - Possibly missing up to 11% of reactions
  - Seriously underrepresenting up to 6% of the users
- What are we missing?
  - Users that for some reason don't use the formal mechanisms
  - Users are sharing an external context outside of the social network
  - Interactions not fully characterized by the existing mechanisms, e.g., group conversations
- But the method is not perfect
  - Underevaluate replies
  - Sensitive to retweet size
  - Reactions due to content outside the timeline are not captured

Next Steps

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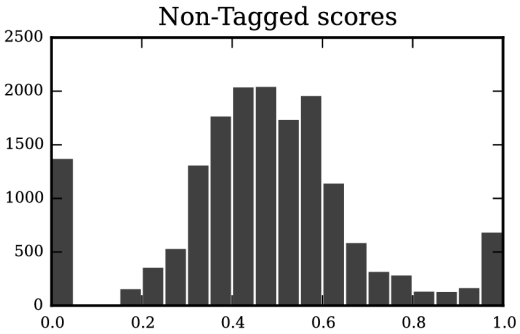
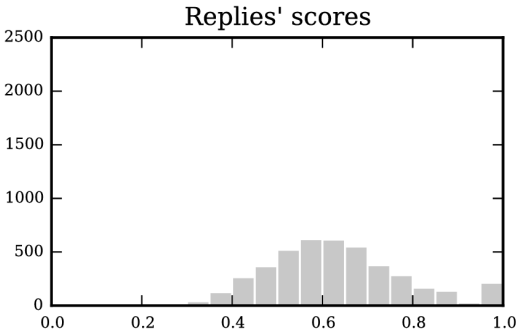
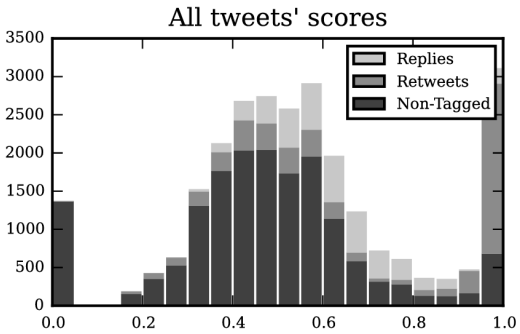
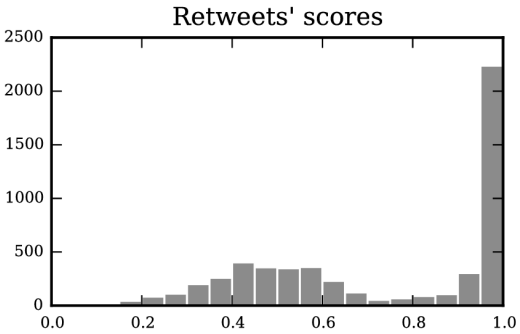
- Improve the scoring function
  - Normalizing by the maximum score for the document
  - Mixture between maximum scoring term and tf-idf score
- Improve the model considering other features, e.g., network characteristics, social media metadata









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