Crowd-in-the-loop

Towards real-time emergency response using crowd supported analysis of social media

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Motivation

- A major crisis happens, such as a natural or man-made disaster
- Situational awareness is distributed
- People share their local knowledge through social media
- Can we collect and organise this information?
- Better and more timely information improves emergency coordination

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Synthesising the big picture from multiple perspectives

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Related work

- Disaster relief & event tracking using social media
  - Hurricane Katrina - craigslist
  - Haiti earthquake - ushahidi
  - North Africa unrest - twitter
  - Hudson river plane crash - twitter
- Media aggregation systems
  - Twitris, the Europe Media Monitor, Breakingnews.com
- Clustering
  - named entity extraction and relevance classification, in particular methods adapted for social media content.
- Crowdsourcing platform design
  - Amazon's Mechanical Turk (mturk.com) and CrowdFlower (crowdflower.com) are directly relevant to this work

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Conceptual architecture
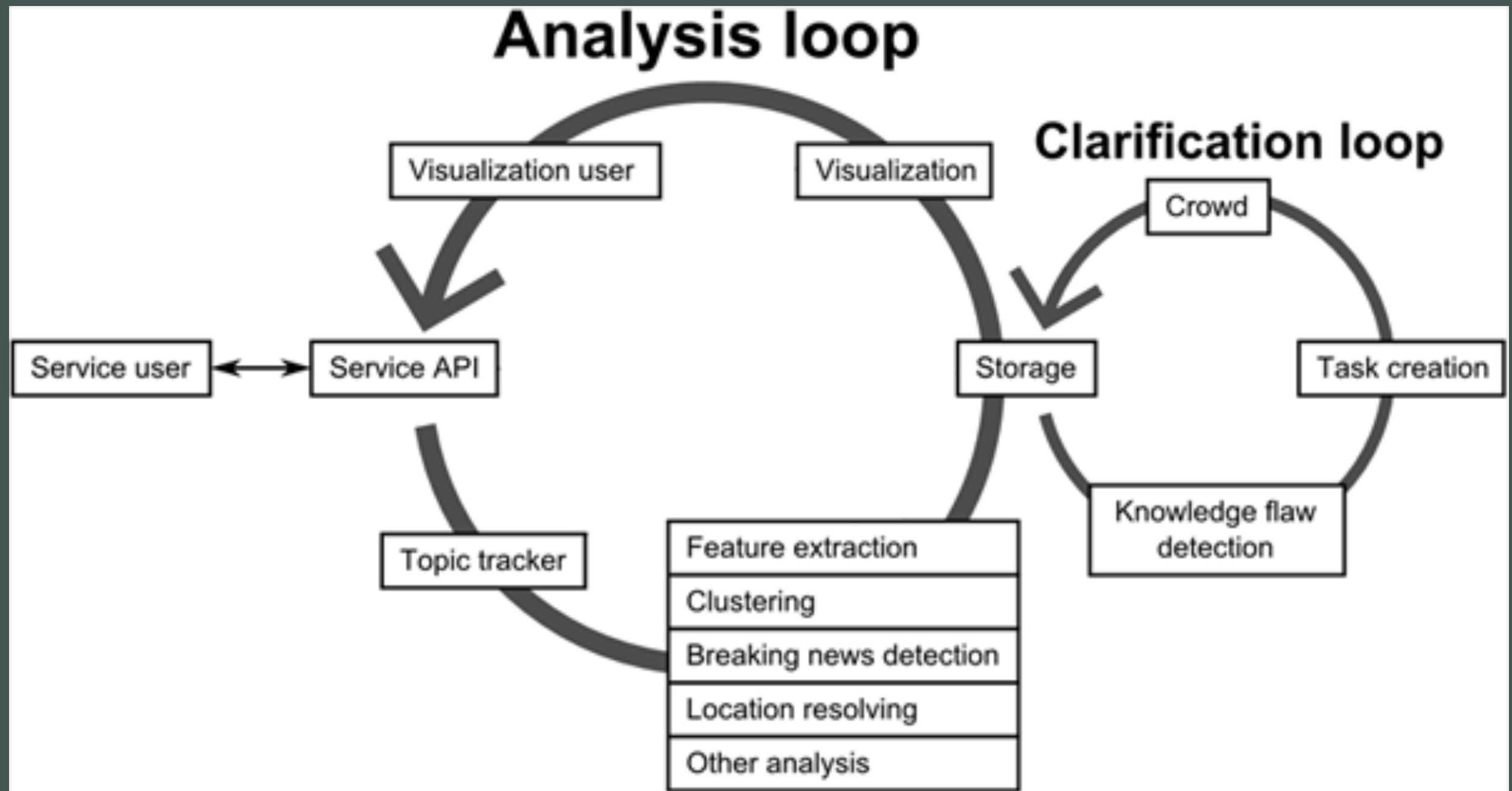
Rogstadius, J., Kostakos, V., Laredo, J., and Vukovic, M. (2011). **Towards Real-time Emergency Response using Crowd Supported Analysis of Social Media**. In adjunct proceedings of the conference on Human factors in computing systems (CHI 2011), Workshop on Crowdsourcing and Human Computation: Systems, Studies and Platforms. Vancouver, Canada.

System architecture
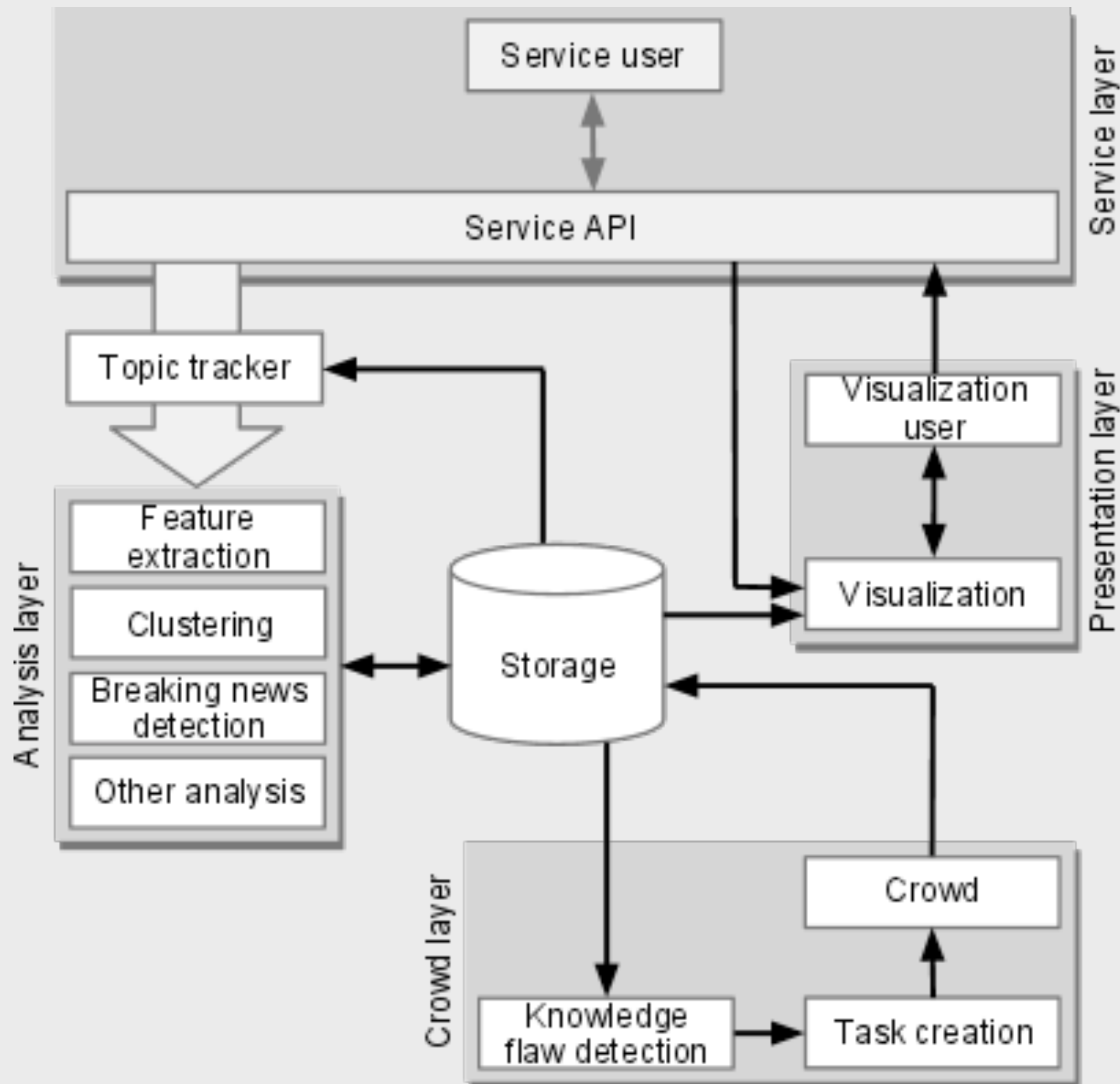
Prototype - Demo?
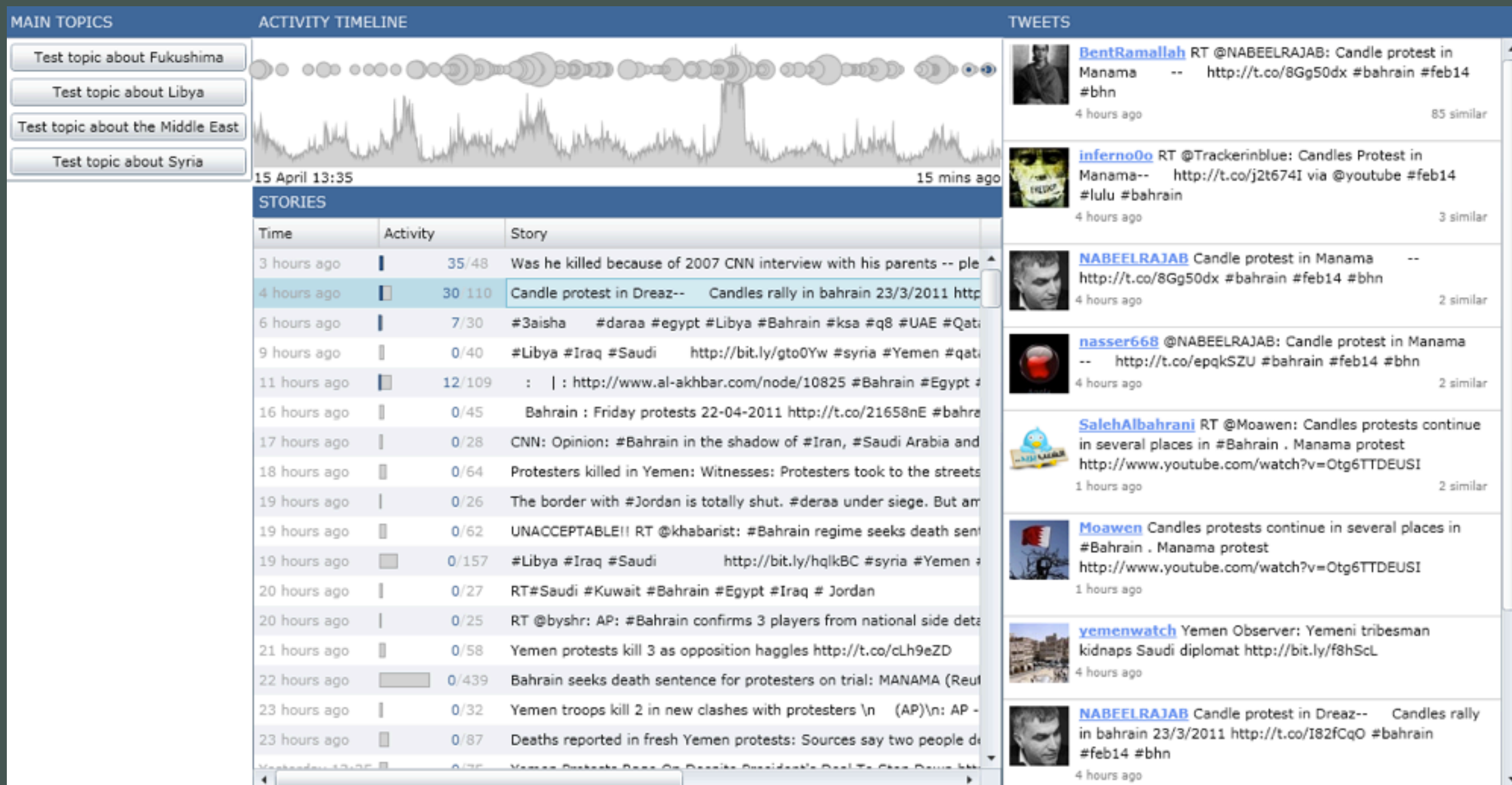
Study 1

Rogstadius, J., Kostakos, V., Kittur, A., Smus, B., Laredo, J., and Vukovic, M. (2011). **An Assessment of Intrinsic and Extrinsic Motivation on Task Performance in Crowdsourcing Markets**. In proceedings of the AAAI Conference on Weblogs and Social Media, Barcelona, Spain.

Study 1

- Can we motivate people to donate their time to a "good" cause?
  - Findings: Complex relationship between rewards (payments), time-to-complete crowdsourced tasks, and the nature of the task itself (is it for a "good" cause?).
  - Application: Develop a better crowdsourcing strategy. We will have to pay people if we want faster, but not necessarily better, results

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Ways to motivate people

- Intrinsic = personal enjoyment, desire to help
- Extrinsic = payment, social status, threats

- Study design
  - Posted work on Amazon's Mechanical Turk
  - Varied payment and cover story (cause)
  - Measured completion speed and accuracy

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The task

- Generated artificial images of infected blood cells

- Task
  - Count blood cells
  - Count parasites in double-dotted ring form
  - Accuracy = weighted average

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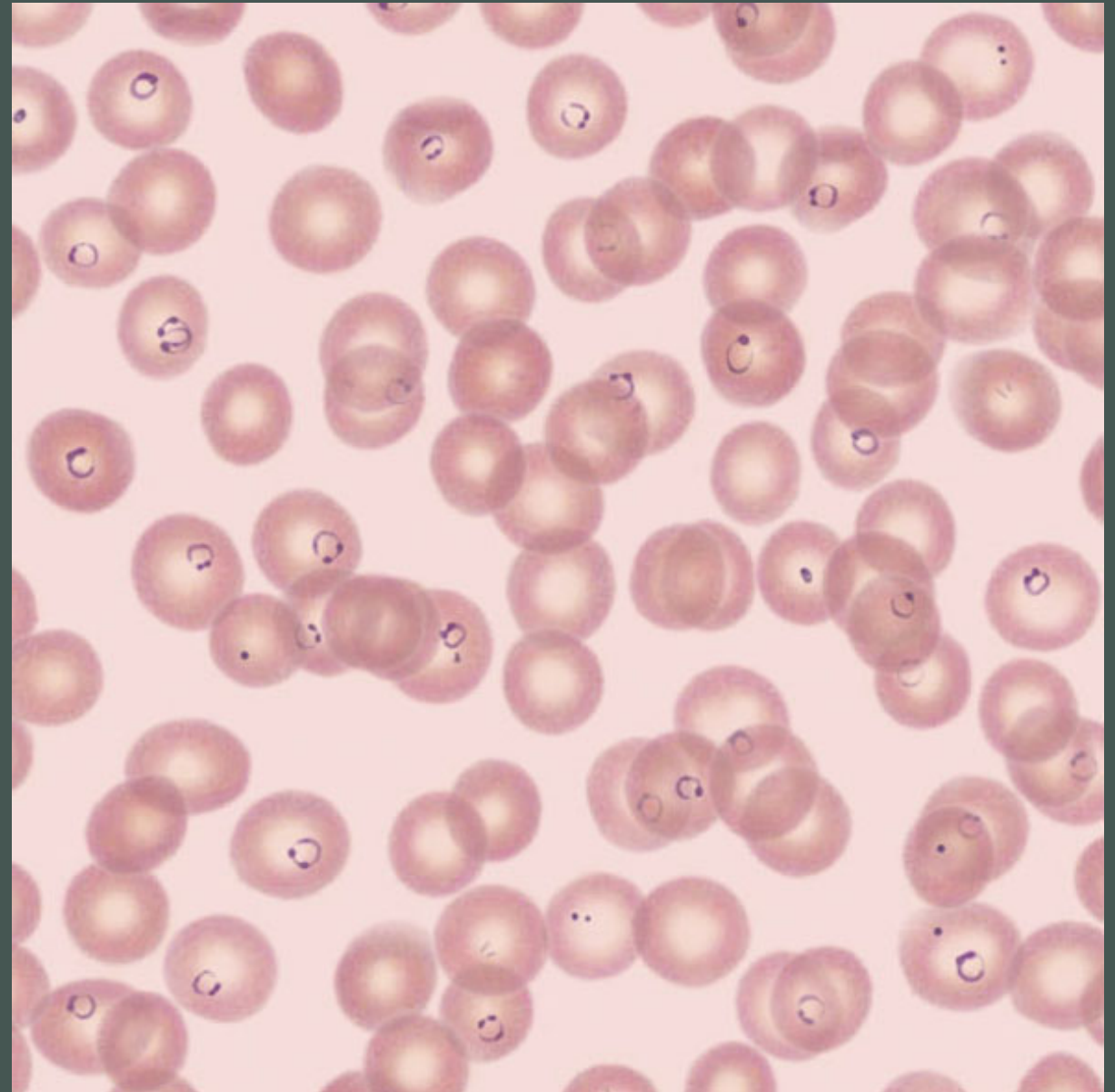
Conditions

- **For charity**: the work is posted on behalf of the World Health Organisation
- **For profit**: the work is posted on behalf of a market-leading pharmaceutical company.
- Reward manipulation:
  - Pay: 0, 3, 10 cents per task
- Task manipulation
  - Number of cells in image
  - Number of parasites in image

Recruitment

- MTurk's "Qualifications" used to allocate people to conditions
- Initial questionnaire => person allocated to one of 6 conditions
  - 2 (cover story) x 3 (payment)
- A person can only see & do tasks from their condition
  - Tasks varied in terms of difficulty
- Ensure that people don't see the same task for different reward.

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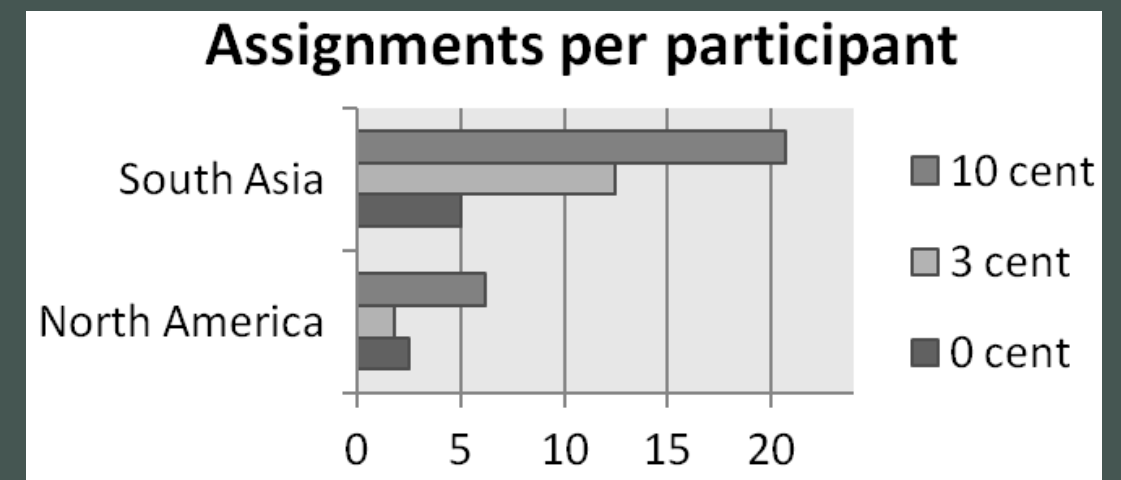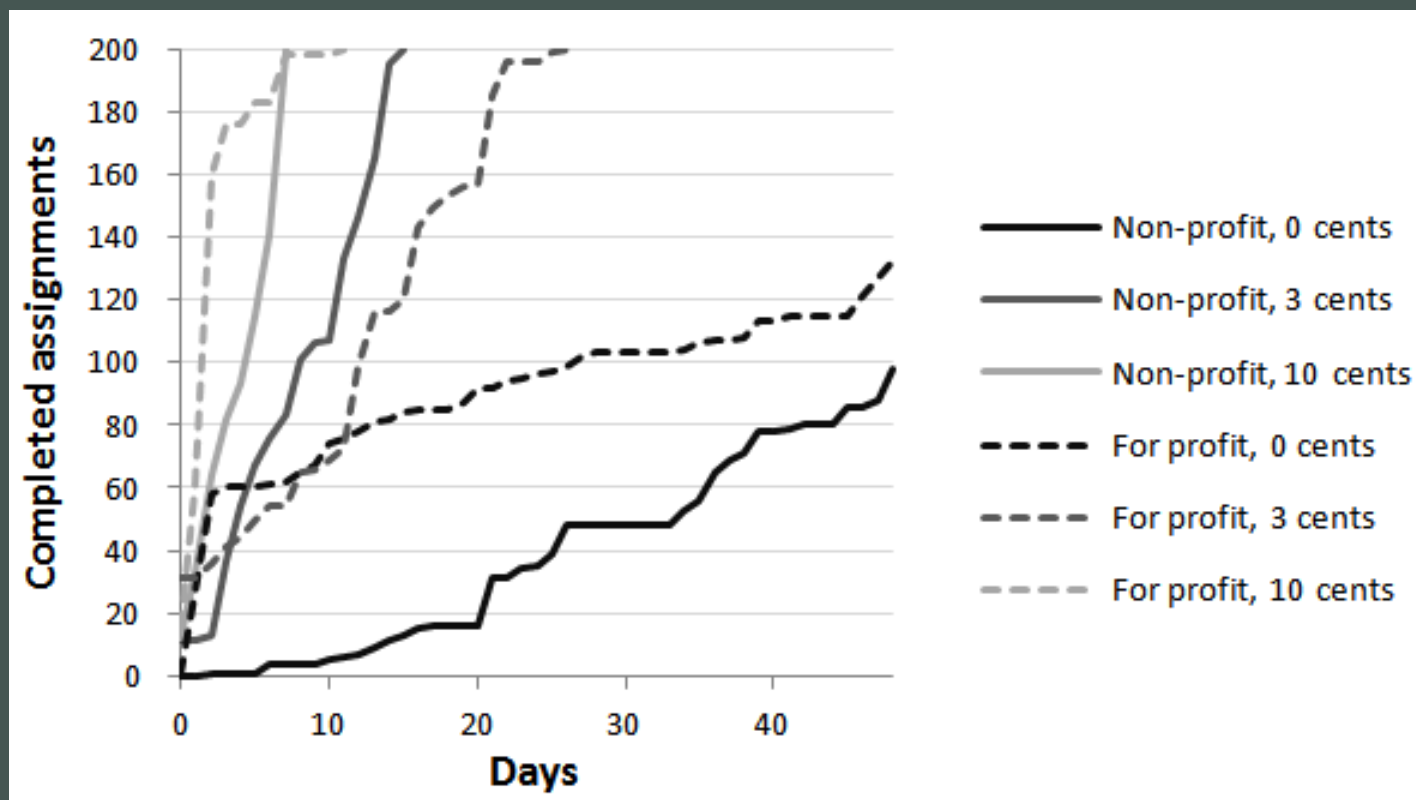
Varying cover story

- Working for charity = generally more accurate
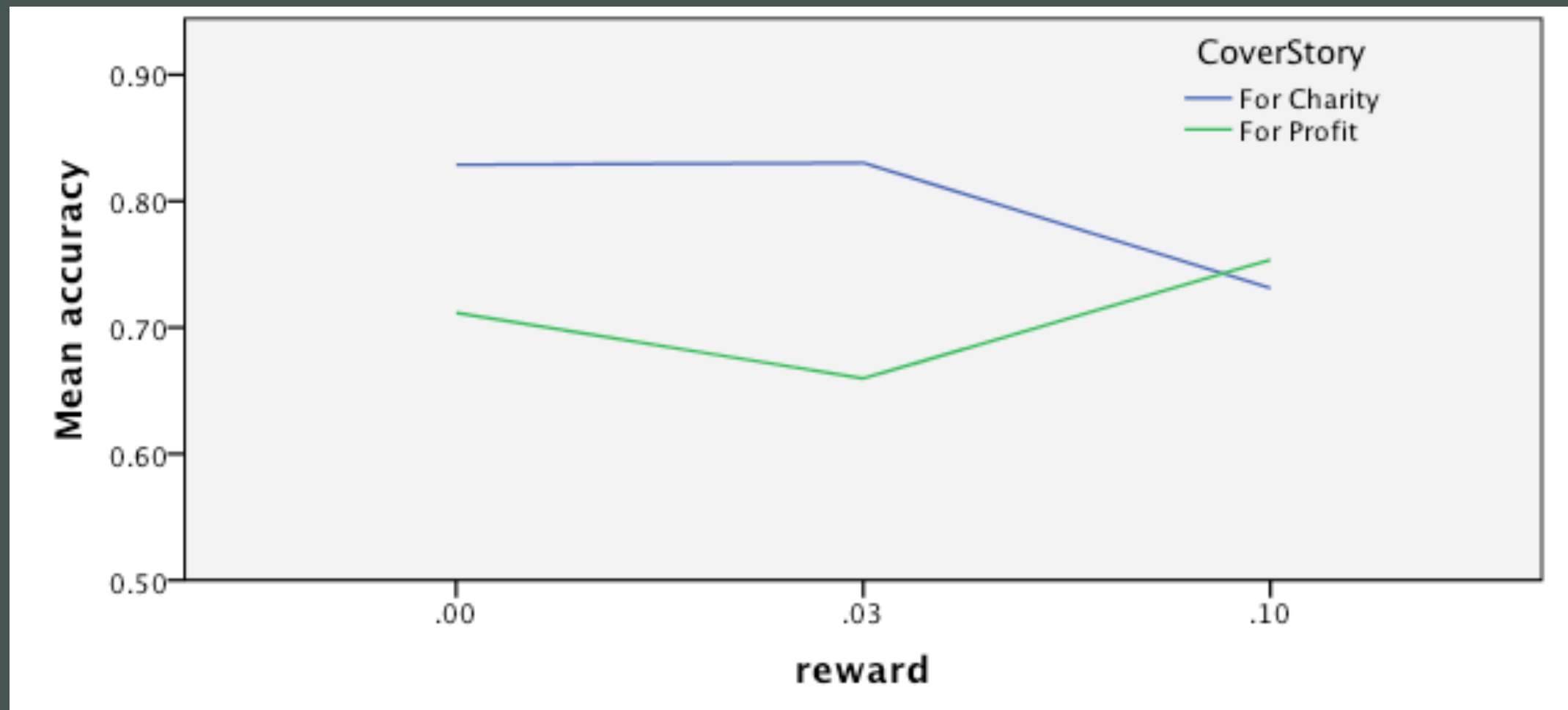- No effect on completion speed
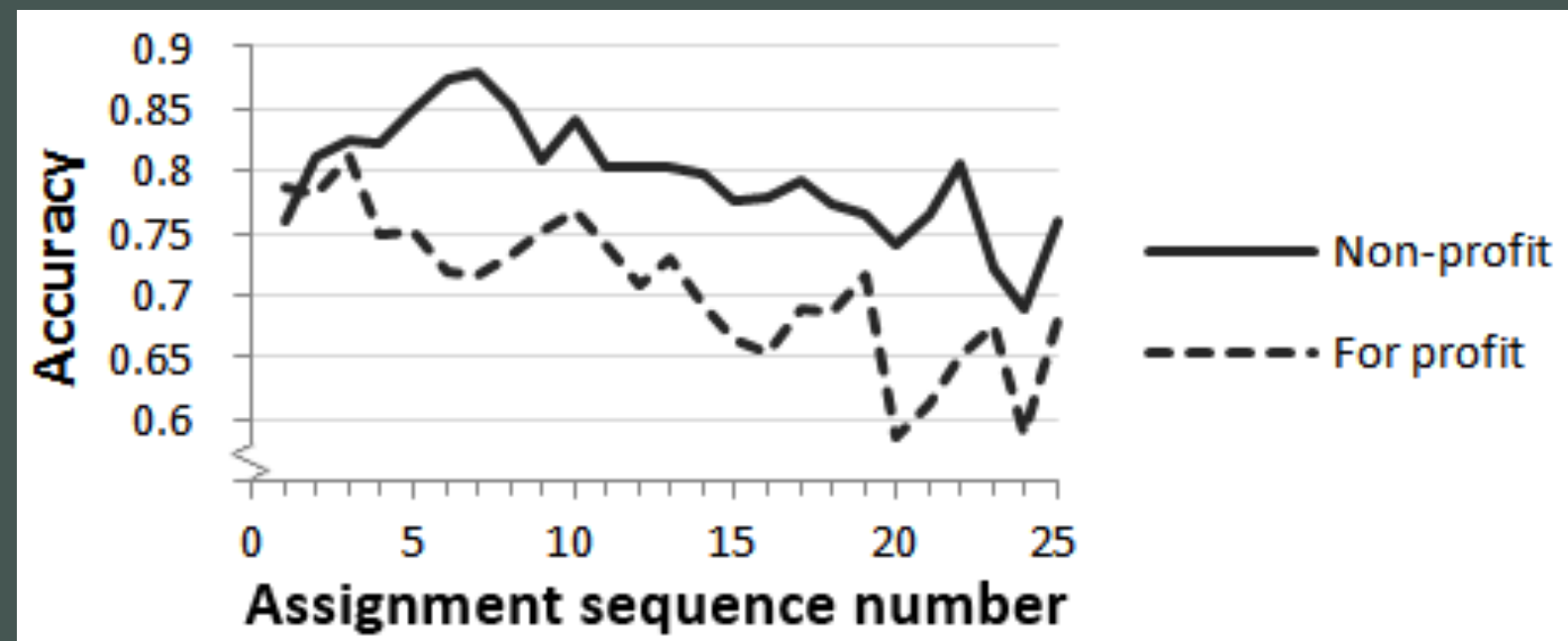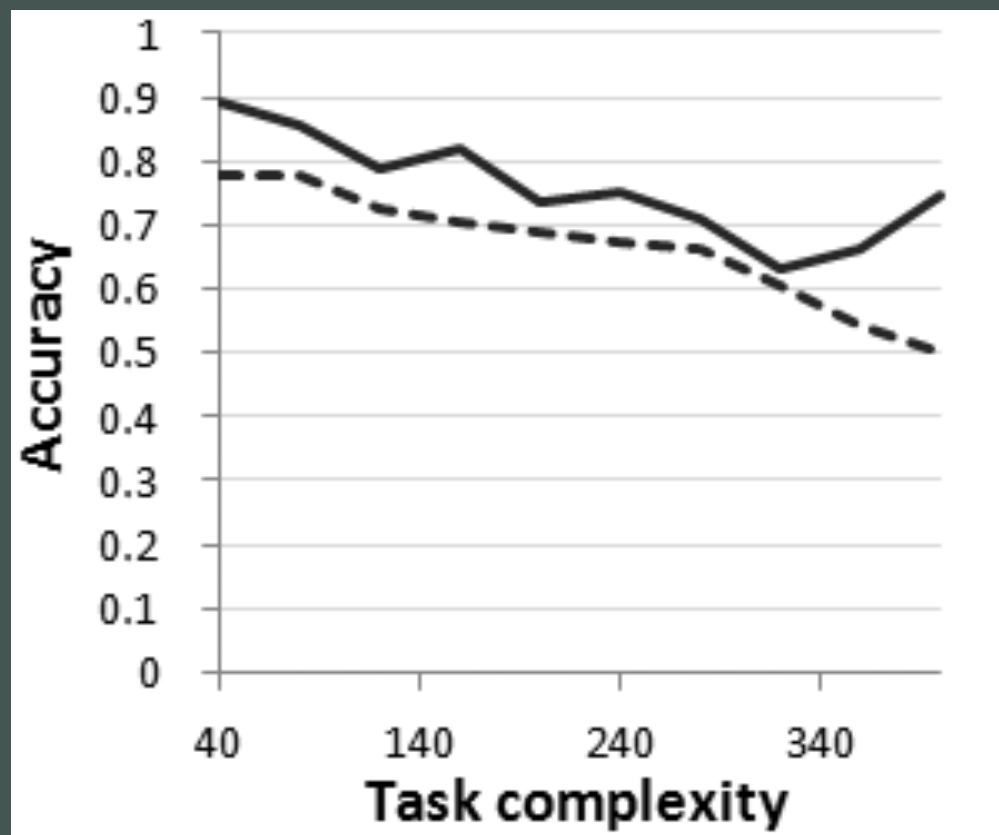
Varying payment

- More money = faster results
- Size of effect varies (with level of income?)
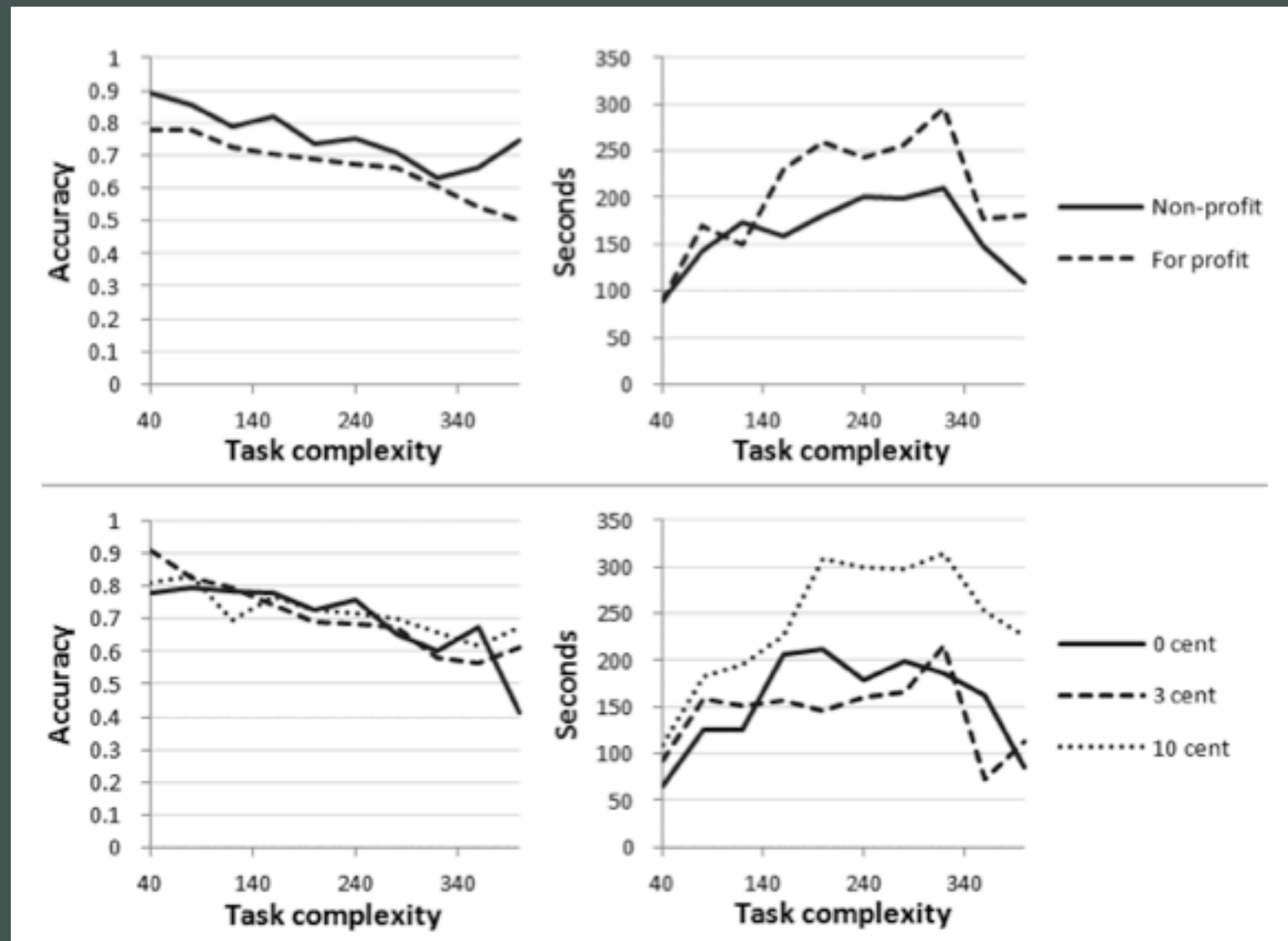- Non-significant effects on accuracy

Interaction effects

- Primary motivation source? Other explanation?
- Worker bias?
- We observed two different reactions to charity cause

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Difficulty threshold

- Beyond some difficulty threshold, people gave up

Study 2

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Study 2

- If people decide to donate their time, how can we help them make best use of their time while contributing to our system?
  - Findings: An understanding of how people judge "similarity" between tweets, what information they find useful, what information they discard (as noise)
  - Application: Avoid overloading our users, give them the information they need to complete the task quickly. Give them the right kind of task.

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Rate the topic similarity of tweet pairs

Reference tweet:		**Tweet 1:**	
Bout time to head off to sonisphere yo :D		Capturas de @Direngrey en el Sonisphere 2010 http://bit.ly/afJmPg	
In reply to:		In reply to:	
Tweet time:	July 30 2010	Tweet time:	August 5 2010
Tweet location:		Tweet location:	
User (nickname):	Connie Raitt (ConnieEvarose)	User (nickname):	AniRockers (AniRockers)
User location:	Banbury	User location:	Venezuela
User followers:	69	User followers:	146
User friends:	81	User friends:	143

How similar are the topics of these two tweets?

Very different   Very similar

○ ○

Reference tweet:

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In reply to:
Tweet time: July 30 2010
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Tweet location:
User (nickname): AniRockers (AniRockers)
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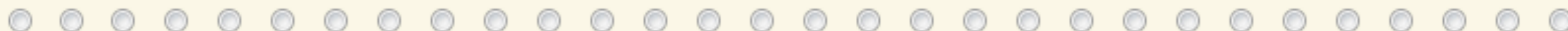User friends: 143

How similar are the topics of these two tweets?

Very different   Very similar

○ ○

For this pair of tweets, which of the following information had any influence (positive or negative) on your topic similarity rating?

- ☐ Hashtags (e.g. #christmas2010)
- ☐ Destination pages of URLs (links)
- ☐ Named entities that were mentioned (e.g. World Cup, Obama, New York, Xbox, Twitter)
- ☐ Sentiment of tweet(s) (e.g. positive/negative)
- ☐ Text in the tweet, excluding hashtags, URLs, sentiment and explicitly mentioned named entities
- ☐ Any text in a reply-to tweet
- ☐ Tweet time(s)
- ☐ Tweet location(s)
- ☐ User name(s)
- ☐ User location(s)
- ☐ User followers
- ☐ User friends

Overview

- Collected tweets relating to different events
  - Music festivals
  - Hurricanes
  - Oil spill
  - Random (control group)
- See how people assess the "similarity" of pairs of tweets
  - Understand how clustering of tweets can be distributed to a crowdsourcing environment
  - Ask them to indicate what information they relied on to complete their assessment
  - 12 independent ratings for each single pair of tweets

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How do people interpret tweets?

- Text (except URLs, entities, sentiment or hash tags) (61.9%)
- Named entities (54.5%)
- Sentiment (30.1%)
- URLs (20.3%)
- Time of tweet (14.1%)
- Hash tags (4.1%)
- Location of poster (3.5%)
- Number of followers (3.3%)
- Number of friends (3.0%)
- Location of tweet (2.9%)
- Any text in the "reply to" tweet (as indicated by Twitter) (2.9%)
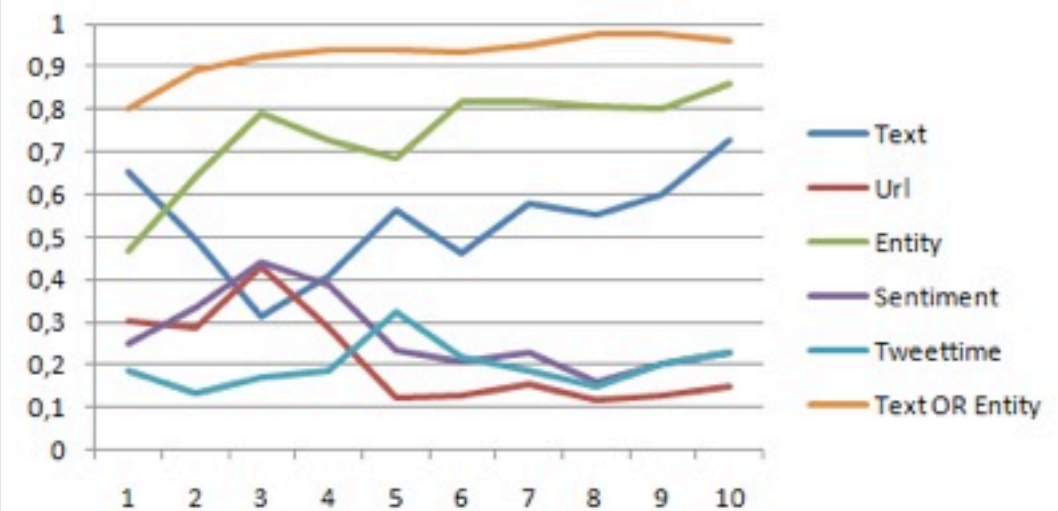- Name of poster (2.7%)

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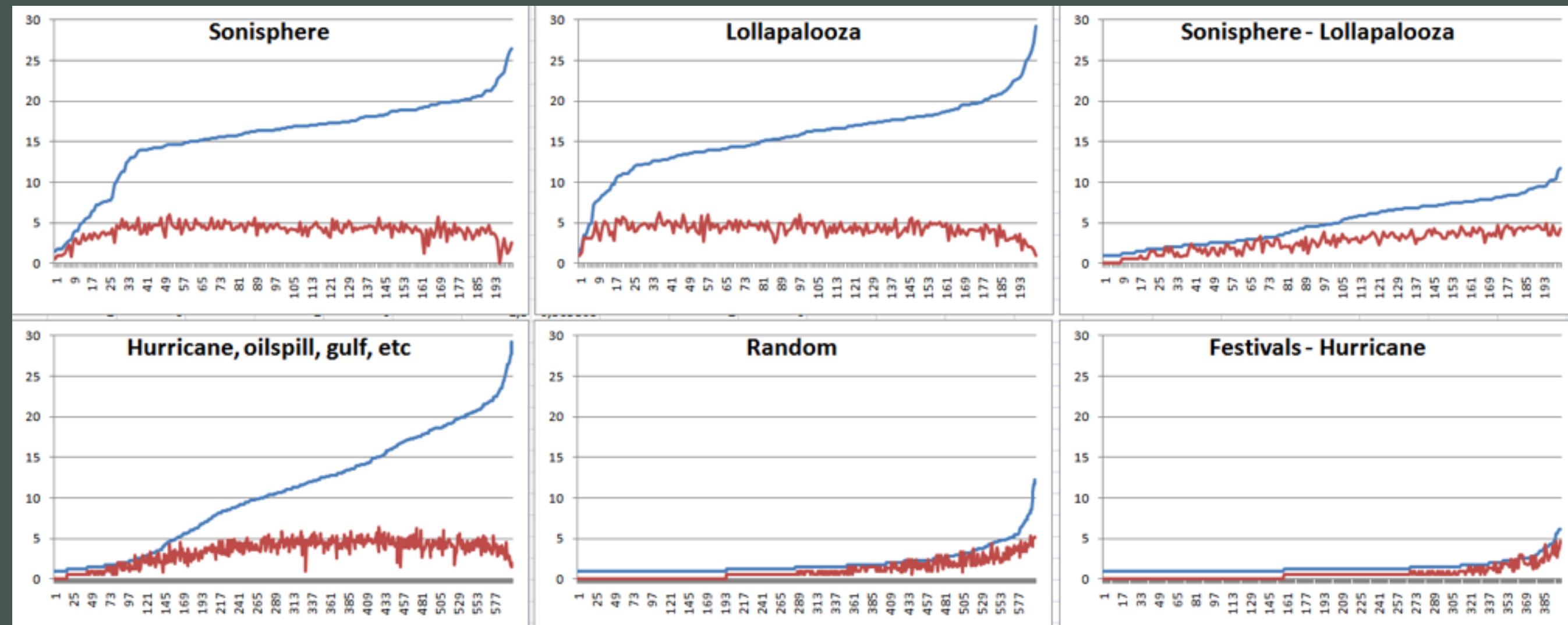Technologies Institute

How do people interpret tweets?
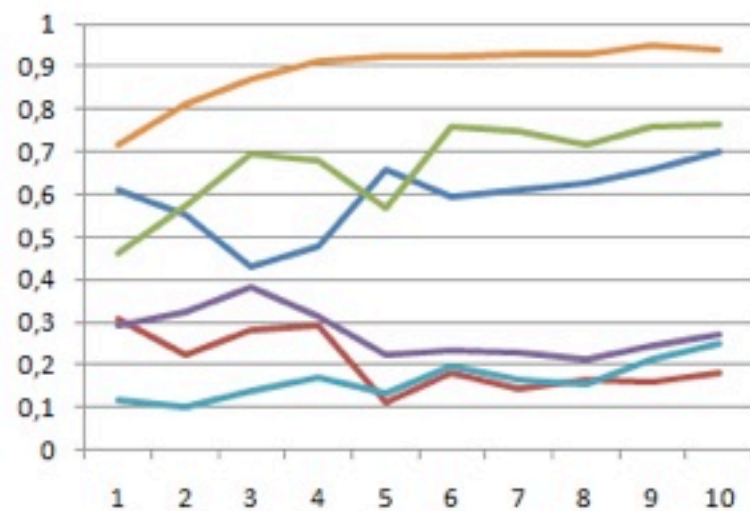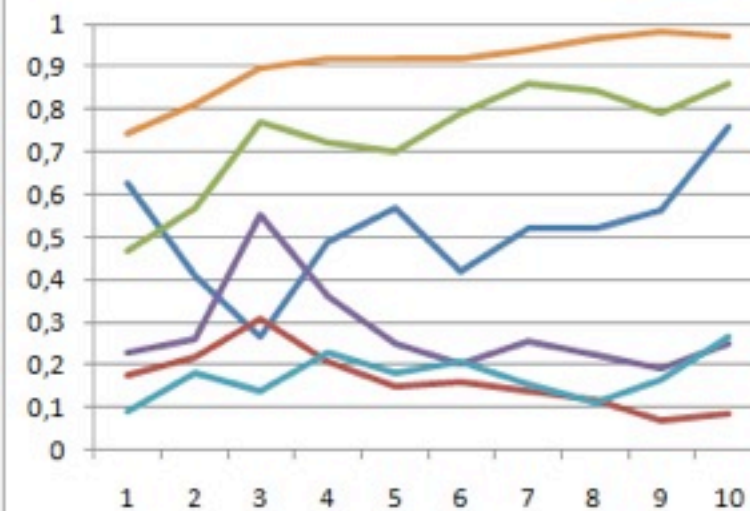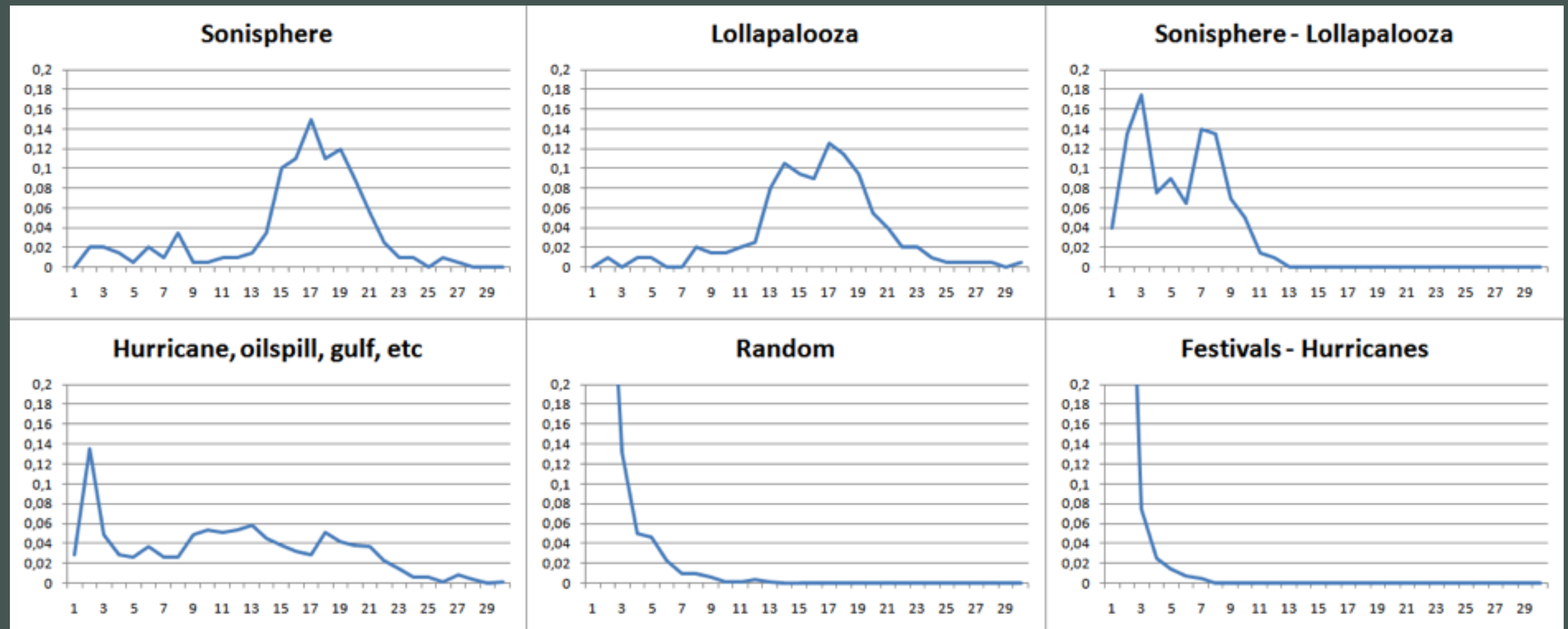

low

Tweet similarity rating

Similarity ratings

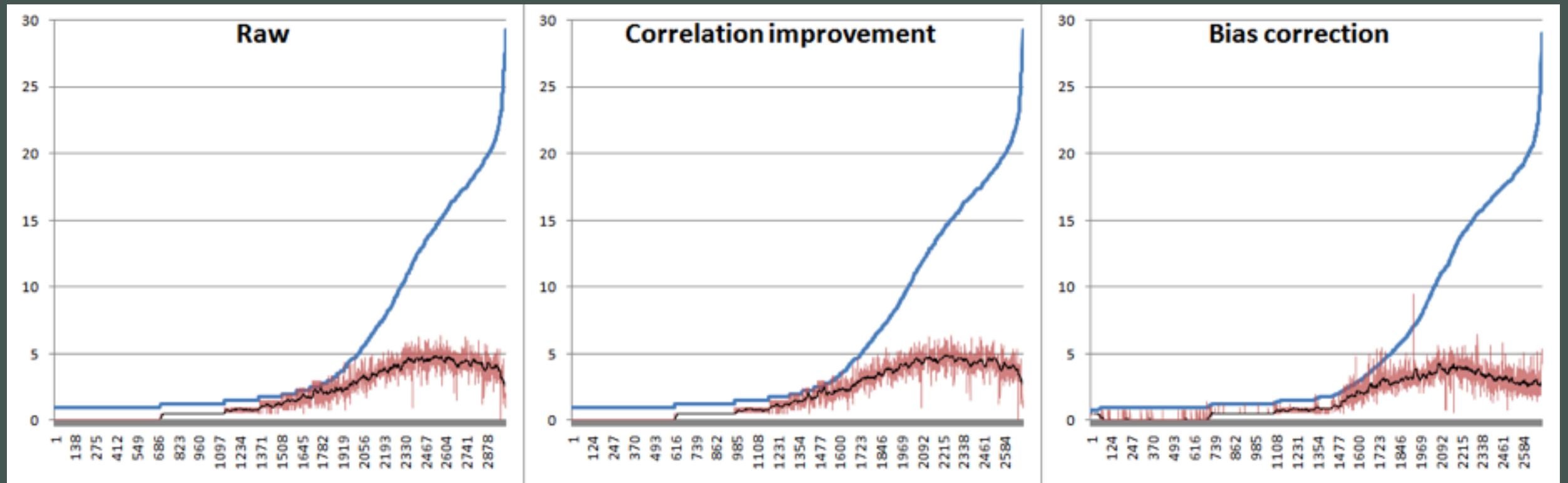Similarity (blue) and stderr (red) for pairs of tweets

Similarity ratings

Probability function of similarity rating for pairs of tweets

Removing "bad" workers
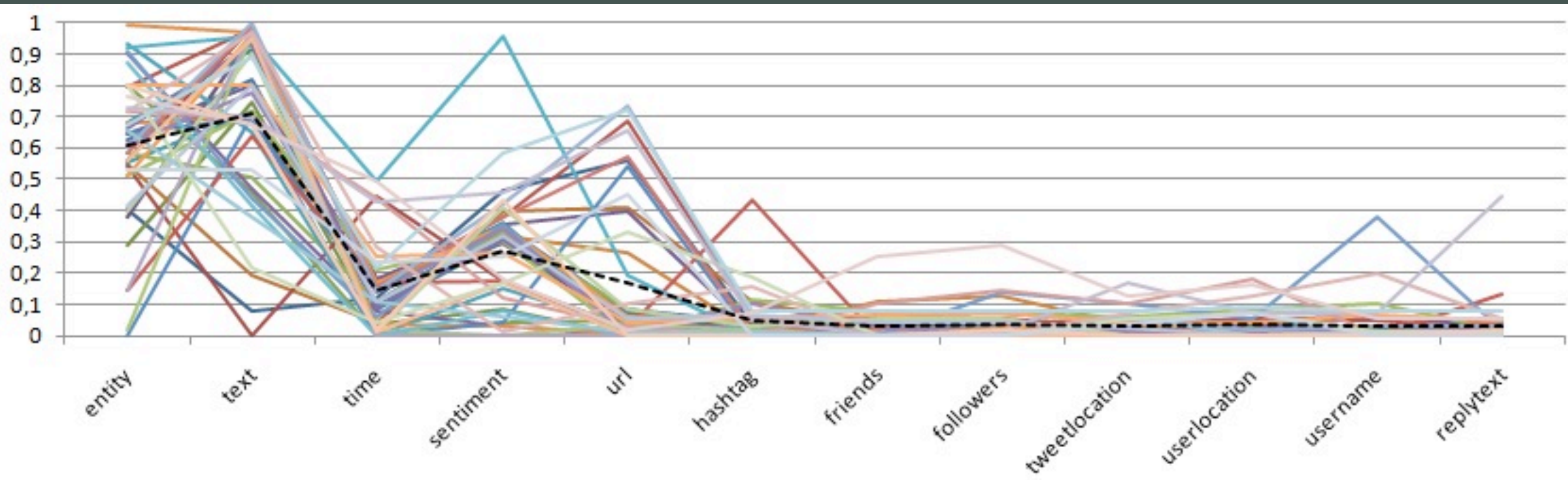

Removing "bad" workers has insignificant effect

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Individual worker strategies

Usefulness of information (y-axis) varies by worker

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In conclusion

Conclusion

- Ongoing work on
  - Understanding better crowdsourcing markets and tasks
  - Integrating crowdsourcing (in-situ?)
  - Deploying crisis tracking software
- Results
  - Study 1 provides evidence regarding worker motivation
  - Study 2 provides evidence regarding worker capabilities

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Publications

- Our work is already being cited by the community (ECSCW Workshop cites our work as motivation)

- Interview on New Scientist (to appear)

- Rogstadius, J., Kostakos, V., Laredo, J., and Vukovic, M. (2011). **Towards Real-time Emergency Response using Crowd Supported Analysis of Social Media**. In CHI 2011, Workshop on Crowdsourcing and Human Computation: Systems, Studies and Platforms.

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