

Awareness about photos on the Web and how privacy–privacy–tradeoffs could help

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- Many privacy issues concerning photo privacy have been discussed at great length in the media...
 - Drunken pics, sexting, embarrassing locations
 - Accidentally published to more people than planned
 - Careless publishing "in the moment"
 - Malicious sharing by receiving party
 - Can be found and used by
 - News Corporations
 - Insurance Companies, etc.
 - Employers
 - Friends/partners

- Microsoft's Scott Charney offered a very good example during his Keynote speech at the RSA Conference 2012:

If a friend takes a picture of me during a volleyball game, shares this picture with other friends and one of them uploads the picture to the web, my insurance company can find and use that picture against me.



- There have been reports that insurance companies are looking for just such information which could raise premiums or even deny claims.¹
- The same is true for banks and credit rating companies.²



¹ <http://abclocal.go.com/kabc/story?section=news/consumer&id=8422388>

² <http://www.betabeat.com/2011/12/13/as-banks-start-nosing-around-facebook-and-twitter-the-wrong-friends-might-just-sink-your-credit/>

- Just in the last two years the number of photos uploaded to Facebook per month has risen from **2 billion to over 6 billion**
- While one's own media is uploaded consciously,
- the flood of media uploaded by others is so huge that it is almost impossible to stay aware of all media
- **and most isn't relevant anyway.**



➤ Awareness about shared photo is key issue

How do people stay informed about photos of themselves and how do they judge privacy issues about them?

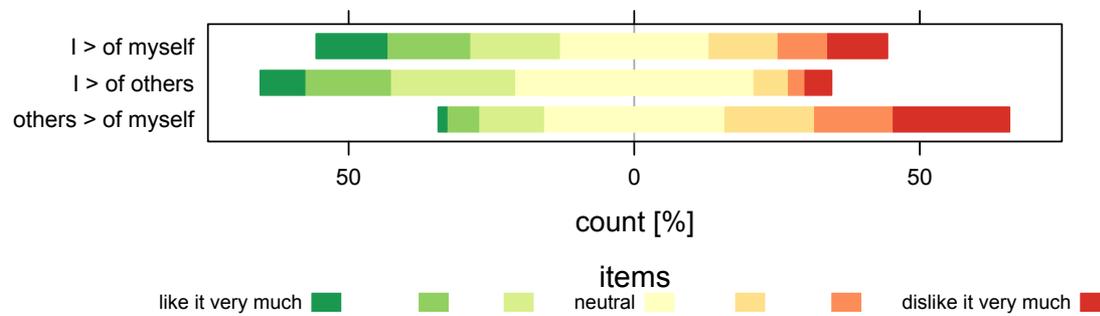
- Invited 1,418 members of university-related mailing list
- Announced as a survey on online privacy
 - Priming bias
 - Intended to get people interested in online privacy
- 414 complete and valid answers
 - 53.9 % male, 46.1 % female; average age 23 ± 4 years
 - 25 % had at least one university degree
 - 22.2 % indicated high or very high technical expertise
 - Westin privacy segmentation index:
91.8 % pragmatists, 6 % fundamentalists, 2.2 % unconcerned

Awareness of media

- How do people think they become aware of photos of themselves?
 - 75 % via automatic notifications (94 % were Facebook users)
 - 52 % by chance
 - 39 % through conversations
 - 30 % through friends' messages
 - 18 % by actively looking
 - 4.6 % through messages of non-friends
 - 3.4 % think they do not gain awareness at all

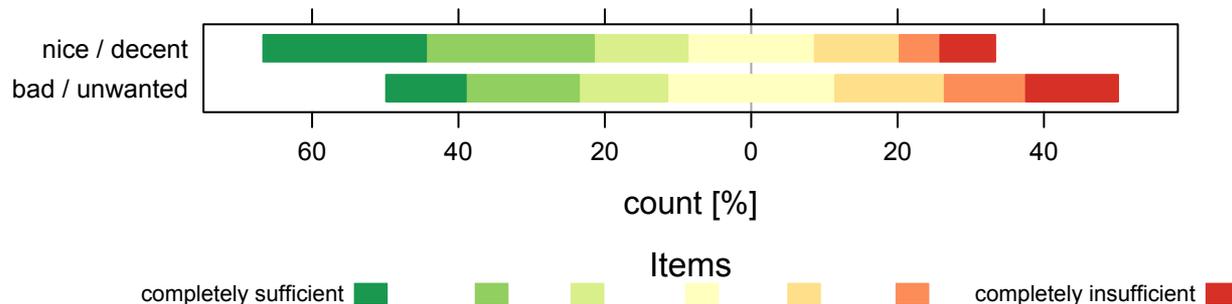
- Linking Profiles to People e.g. on Facebook makes people aware of those photos – they are notified and can take actions
- How do people perceive tags?

Rate the effect of people tags: Who find photos of whom.



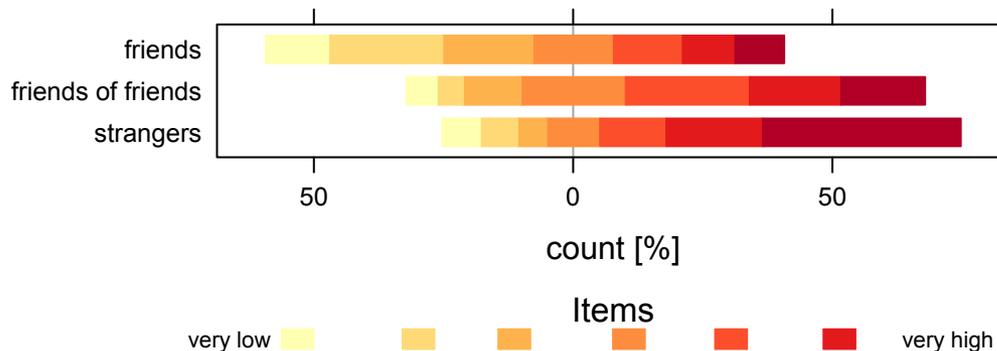
- *Participants significantly prefer finding photos of others (3.51, sd=1.37) to finding photos of themselves (3.79, sd=1.8, tending to neutral)*
- *They dislike that others can find photos of them (4.77, sd=1.55)*

- Nice/Bad photo awareness:
 - *How well do you feel informed about all photos of yourself?*



- Nice / decent photos
22 % completely sufficient informed; 25 % in worst-three
- Bad / unwanted / objectionable photos
11 % completely sufficient informed; 39 % in worst-three

- Estimate a possible privacy violation of photos shared by ...



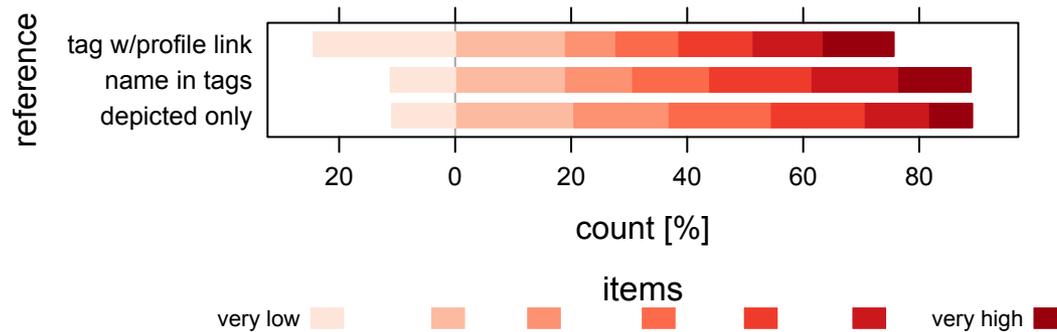
friends: 3.64 (sd=1.85)

foaf: 4.69 (sd=1.66)

strangers: 5.23 (sd=1.95)

- It also seems that participants do not trust that others comply with a "moral obligation" even though most declare they themselves do
 - Rate the influence of threats to others and threats to yourself as decision-making criteria for sharing a photo (not at all → very much).
 - 2 % do not think about threat to other at all
 - 98 % do. - 61.0 % rate both with same value
 - 6.6 % rate threats to others higher than to themselves

- Estimate the risk that someone finds an unwanted photo in future (very low → very high).



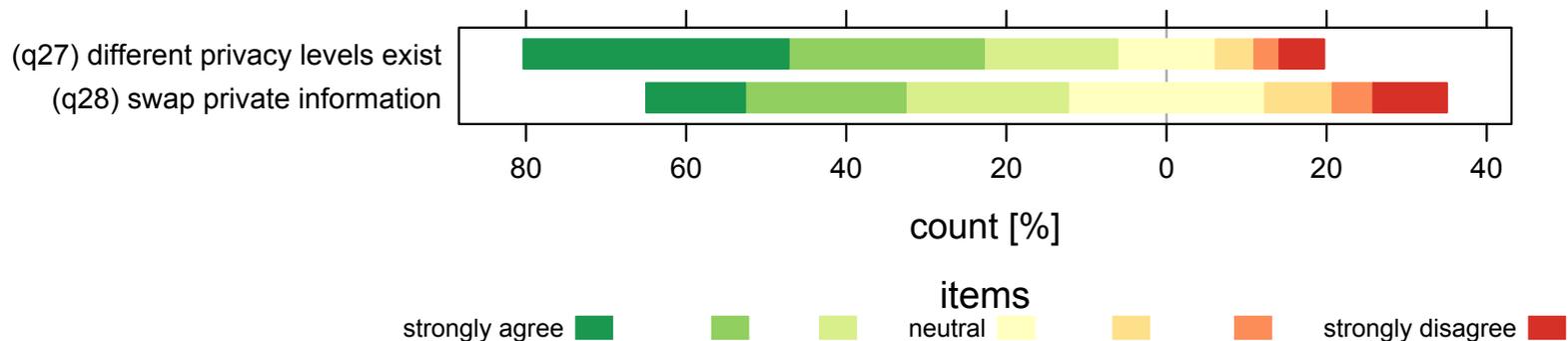
- Profile linked to photo: 24 % very low; 35 % in worst-three
 - Personal reference in Metadata: 11 % very low; 45 % in worst-three
- Participants believe photos with personal references to be worse than photos with links to profiles

Privacy Privacy Trade-off

- Traditional privacy research aims to preserve users' privacy at all cost
- We propose: this is not necessarily desirable in all real world systems, especially in the social Web that lives from contributing and sharing
 - Different types of information is not equally private to people
 - We group these according to **privacy levels**
 - We could leverage this distinction to help users
 - We propose using some less private information to secure other more private information
 - Example: Users may trade where they are for photos taken at that locations

- *Do privacy levels exist?*
 - 74.2 % agreed (33.1 % strongly)
 - 12.3 % were neutral
 - 13.5 % disagreed (5.6 % strongly)

- *In general would you share some private information to secure other more private information?*
 - 52.7 % agreed
 - 24.5 % were neutral
 - 22.7 % disagreed



Media Metadata

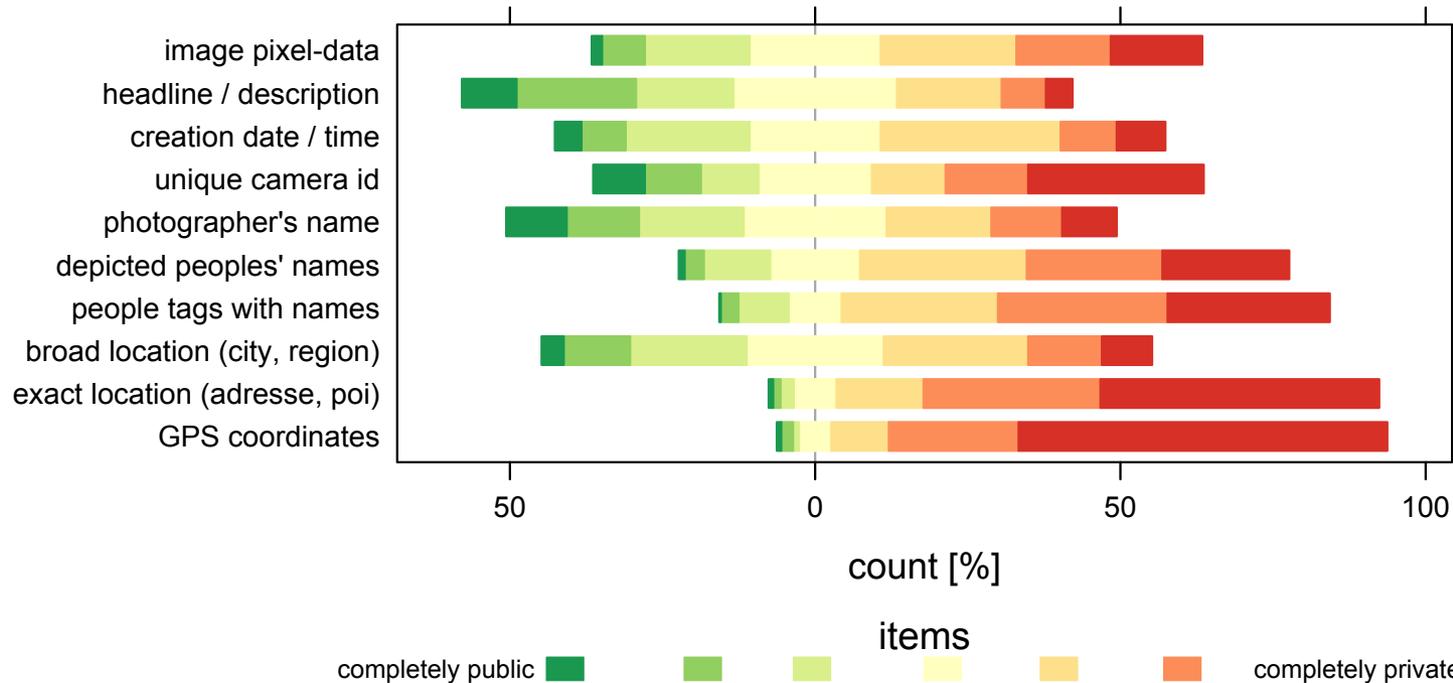
1. Associate photo to person
 - Non-technical: person is recognizable on photo
 - Technical: image metadata contains link (name, unique identifier)
 2. Photo contains objectionable content
 - Non-technical: image shows embarrassing actions or setting
 - Technical: image metadata contains objectionable entries like time, location, personal references
- Metadata increasingly is automatically added and users may not be aware of embedded metadata.



John McAfee in hiding

- 61 % of participants had knowledge about photo metadata,
- of those:
 - 6 % remove all metadata before upload
 - 35 % remove parts of it before upload
 - 2 % say their online services remove metadata
 - 58 % do not know what online services do with metadata
 - 29 % do not know which information is stored in metadata after upload
 - 27 % do not think about metadata at all
 - 9 % think metadata is an important part of online sharing

- How do you feel about the privacy of following metadata?



- GPS: $m=6.26$, $sd=1.2$, 91.1 % somewhat private, 60.4 % completely private
- Address: $m=6.02$, $sd=1.4$, 88.9 % somewhat private, 45.7 % completely private
- Depicted people w/o bbox: $m=5.14$, $sd=1.4$
- Photographer's name: $m=4$, $sd=1.7$

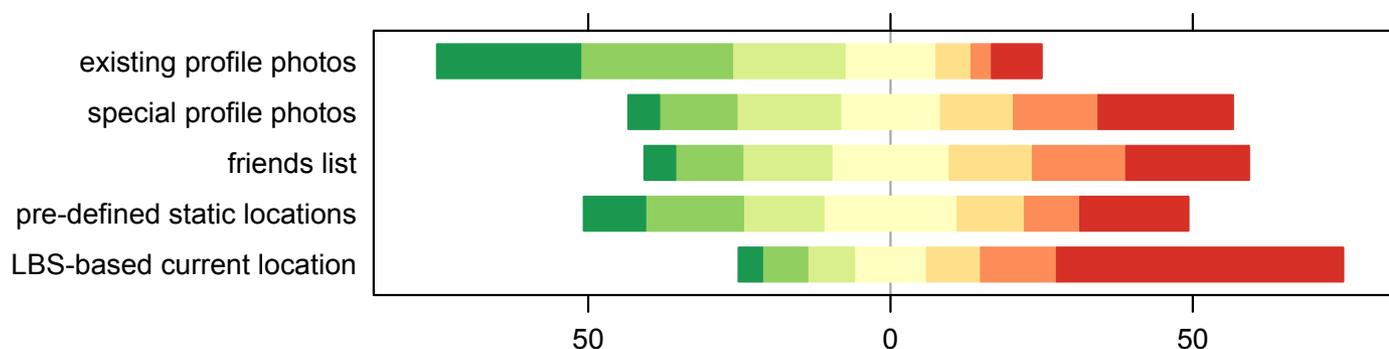
- Krumm et al. summarizes different results that show that people do not seem to care about location privacy: For instance, in several studies participants were ready to share weeks and months of location traces for a small amount of money and only one fifth objected to commercial use of that data.
 - Krumm, J. A survey of computational location privacy. *Personal and Ubiquitous Computing* 13, 6 (2009), 391 – 399.
- In the “very-upset-ranking” of 99 risks associated with different smartphone permissions of Porter Felt et al., the participants ranked location-related risks in the bottom half and the actual location was ranked second-lowest out of eleven data types.
 - Porter Felt, A., Egelman, S., and Wagner, D. I've got 99 problems, but vibration ain't one: a survey of smartphone users' concerns. In *Proc. SPSM, ACM* (2012), 33–44.

- Participants rated location to be metadata with highest privacy impact
 - while recent related work states that location is not a great concern.
 - Possible reasons for this contradiction:
 - Different Use Cases: geo-tag in photo vs. location-based service
 - Different Culture: Germans vs. American
 - Different Audience: SNS friends/other people vs. company
 - Different Study: Non-obfuscated/Bias
- *Location Privacy Revisited: Factors of Privacy Decisions*
(CHI '13 Extended Abstracts)

Privacy Privacy Trade-off

- What information would you disclose to a photo-sharing service to find photos of yourself that you otherwise would not be able to find? (strongly agree → strongly disagree)

Information	Agree	Agree/Not mind
profile picture	67.5 %	82.6 %
training photos	35 %	51.7 %
friends list	30.9 %	50.5 %
private locations	39.6 %	61.8 %
LBS-location	19.1 %	31.2 %



- *"I am less upset if someone finds out where I have been than if that person gets to see private photos of myself."*
 - *mean 3.0 (sd=1.7); 66.2 % agreed, 15.7 % neutral*
- *"I am less upset if my SNS knows where I have been than if my friends and strangers gets to see unwanted photos of myself."*
 - *mean 3.3 (sd=1.8); 60.4 % agreed, 16.2 % neutral*
- *"If there is a privacy service that notifies me about unwanted photos in which I am depicted but needs to know where I have been, I would use it. I would tell it where I have been to get to see potential photos of myself."*
 - *mean 3.7 (sd=1.8); 53.2 % agreed, 16.1 % neutral*

- Only 5.6 % strongly felt that there were no difference in privacy levels
- In general, 77.2 % agreed or were neutral towards p-p-tradeoffs
- Asked about the privacy value of single types of data participants clearly ranked the different types of data
 - While many would trade their SNS profile picture, they were more reluctant about other information
- However, a considerable amount of participants stated that they would prefer trading private information when presented with a negative example scenarios:
 - 60.4 % preferred their SNS knowing where they, if this could prevent other people seeing unwanted photos
 - 53.2 % directly agreed to using a service offering this privacy-privacy-tradeoff

Users define private locations on a map or update their current location at the service using a LBS. Based on co-location checks of users' location and the location information of photos uploaded to the SNS via the service, the service notifies users who may be depicted in a photo based on respective locations.

