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Policy Recommendation System for Uploaded Images on Content Sharing Sites

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Abstract

Social media have become important since it allows us to communicate with lot of people. Users of social-networking service share personal information with a large number of "friends" which leads to privacy violation where the users are sharing the large volumes of images across more number of peoples. To overcome privacy violation, policy prediction system is proposed which help users to automate the policy prediction for each uploaded images by analyzing the image content and metadata. A two-level framework is proposed to determine the best available policy for the user's images based on the user's available history on the site.

Keywords*: Social media, Content sharing sites, Privacy, Metadata.*

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1. Introduction

Online social networks are websites that allow users to build connections and relationships to other Internet users. Social networks store information remotely, rather than on a user's personal computer. Social networking helps to keep in touch with friends, make new contacts and also to find people with similar idea and interests. Internet privacy is defined as (1) what information one reveals about oneself, and (2) who can access that information. Essentially, when the data is accessed without the user's knowledge then privacy is violated. In case of usage of the data, the purposes and intentions of the data used should be informed to the owner. Most content sharing websites allow users to enter their privacy preferences. Unfortunately, recent studies have shown that users struggle to set up and maintain such privacy settings [6], [7]. One of the main reasons provided is that given the amount of shared information this process can be tedious and error-prone [4], [5]. Therefore, many have acknowledged the need of policy recommendation systems which can assist users to easily and properly configure privacy settings [1], [2], [3]. The privacy of user data can be given by using two methods: (a) the user alone can enter the privacy preferences, and (b) usage of recommendation systems which assist users for setting the privacy preferences. The privacy policy of user uploaded data can be provided based on the user social environment and personal characteristics. Social context of users, such as their profile information and relationships with others may provide useful information regarding users' privacy preferences. The privacy policy of user uploaded image can be provided based on the

user uploaded image's content and metadata. A hierarchical image classification which classifies images first based on their contents and then refines each category into subcategories based on their metadata. Images that do not have metadata will be grouped only by content. Such a hierarchical classification gives a higher priority to image content and minimizes the influence of missing tags. Paper proposed the Policy Prediction system to provide users a hassle free policy setting by automatically generating personalized policies. The Policy Prediction System handles user uploaded images, in the following way:

- *The impact of social environment and personal characteristics*: Social context of users, such as their profile information and relationships with others may provide useful information regarding users' policy setting. For example, users interested in photography may like to share their photos with other amateur photographers.
- *The role of image's content and metadata*: In general, similar images often incur similar policy preferences, especially when people appear in the images. For example, one may upload several photos of his kids and specify that only his family members are allowed to see these photos.

2. Related Work

The following works are related to the recommendation system and privacy setting configurations which were helpful for developing the policy recommendation for uploaded images on content sharing sites. Bonneau et al. [2] proposed the concept of privacy suites which recommend to users a suite of privacy settings that "expert" users or other trusted friends have already set, so that normal users can either directly choose a setting or only need to do minor modification. Similarly, Danezis [8] proposed a machine-learning based approach to automatically extract privacy settings from the social context within which the data is produced. Parallel to the work of Danezis, Adu-Oppong et al. [9] develop privacy settings based on a concept of "Social Circles" which consist of clusters of friends formed by partitioning users' friend lists. Ravichandran et al. [10] studied how to predict a user's privacy preferences for location-based data (i.e., share her location or not) based on location and time of day. Fang et al. [11] proposed a privacy wizard to help users grant privileges to their friends. The wizard asks users to first assign privacy labels to selected friends, and then uses this as input to construct a classifier which classifies friends based on their profiles and automatically assign privacy labels to the unlabelled friends. More recently, Klemperer et al. [12] studied whether the keywords and captions with which users tag their photos can be used to help users more intuitively create and maintain access-control policies. The aforementioned approaches focus on deriving policy settings for only traits, so they mainly consider social context such as one's friend list. As far as images, authors in [13] have presented an expressive language for images uploaded in social sites. This work is complementary to ours as we do not deal with policy expressiveness, but rely on common forms policy specification for our predictive algorithm. Chen et al. [9] proposed a system named SheepDog to automatically insert photos into appropriate groups and recommend suitable tags for users on Flickr. They adopt concept detection to predict relevant concepts (tags) of a photo. Choudhury et al. [10] proposed a recommendation framework to connect image content with communities in online social media. They characterize images through three types of features: visual features, user generated text tags, and social interaction, from which they recommend the most likely groups for a given image. Similarly, Yu et al. [14] proposed an automated recommendation system for a user's images to suggest suitable photo-sharing groups.

3. Architecture

The figure 1 represents the system architecture of the proposed system. When the user uploads an image, the image classification module classifies the image based on content and metadata associated with the image which finally results into similar images and then the following policies are predicted for the uploaded image. The policies are inspired by popular content sharing sites.

A privacy policy *P* of user *u* consists of the following components:

- *Subject (S): A set of users socially connected to u.*
- *Data (D): A set of data items shared by u.*
- *Action (A): A set of actions granted by u to S on D.*
- *Condition (C): A Boolean expression which must be satisfied in order to perform the granted actions*

Once the policy is predicted, it is displayed to the user, the user has two options with the predicted policy either accepting the policy or revising the policy. If the user accepts the policy then the image is uploaded to the content sharing sites with the same recommended policy or the user can give the policy for the image with which the image will be uploaded to the content sharing sites.

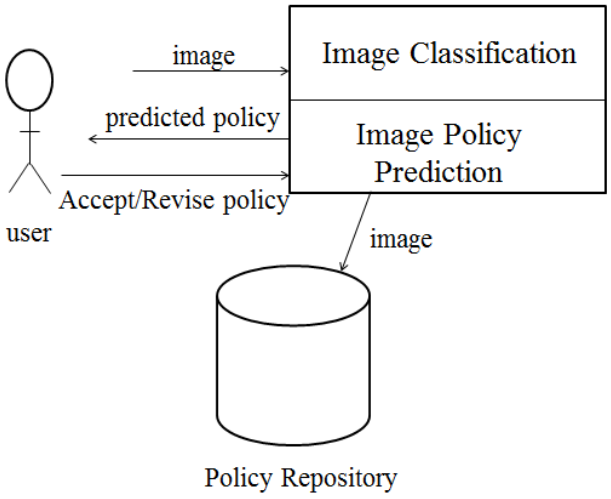

Fig. 1: System Architecture

4. Image Classification

To obtain groups of images that may be associated with similar privacy preferences, we propose a hierarchical image classification which classifies images first based on their contents and then refine each category into subcategories based on their metadata. Images that do not have metadata will be grouped only by content. Such a hierarchical classification gives a higher priority to image content and minimizes the influence of missing tags. Note that it is possible that some images are included in multiple categories as long as they contain the typical content features or metadata of those categories. Images are classified based on content and metadata. Content based image classification is essential for retrieving accurate image similarity. Our classification algorithm compares image signatures defined based on quantified and sanitized version of Haar wavelet transformation. For each image, the wavelet transform encodes frequency and spatial information related to image color, size, invariant transform, shape, texture, symmetry, etc. Then, a small number of coefficients are selected to form the signature of the image. The content similarity among images is then determined by the distance among their image signatures. Metadata classification is the classification of images based on the tags associated with the image. The first step is to extract keywords from the metadata associated with an image. The metadata considered in our work are tags, captions, and comments.

5. Image Policy Prediction

The policy phase may generate several candidate policies while the goal of our system is to return the most promising one to the user. Thus, we present an approach to choose the best candidate policy that follows the user's privacy tendency. Policy Prediction predicts the policy for the uploaded image based on the available information of the user in the repository.

Table 1: Example of Subject Component

PolicyID	Family	Friend	Co-worker	Others
P2	0	0	1	0
P5	1	1	1	0
P9	0	1	0	0
P13	1	1	0	0
P18	0	1	1	0
P22	1	0	0	0

Table 2: Example of Action Component

PolicyID	View Only	Comment	Tag	Download
P5	0	1	1	0
P9	1	0	0	0
P13	0	1	1	0
P18	0	1	1	1
P22	1	0	1	1

Table 3: Example of Condition Component

PolicyID	Age	Location	Time	Affiliation
P5	1	1	1	0
P13	1	0	1	0
P18	1	0	0	0
P22	0	0	1	1

Example 1: Alice would like to allow her friend and family to view the image named "summer.jpg" before year 2012. Her policy would be P13, P9 and P13 for subject, action and condition policies respectively.

6. Result

The predicted policy of the fig 2 is obtained by comparing the images available in the repository. The similarity measure like 0 and 59 in fig 3 represents the certain similarity between the uploaded and the image available in the repository, where 0 represents exact image and 59 represents certain dissimilarity. If the exact

Fig. 2: Uploaded Image

0 P13 9 P5

59 P2 P5 P5

Fig 3: Similar images with Predicted Policy

image is present in the repository then the predicted policy becomes the recommended policy for the uploaded image else the recommended policy should be selected by the user based on the predicted policy obtained for the similar images.

7. Conclusion

Proposed Policy Prediction System helps users to automate the privacy policy settings for their uploaded images. The Policy prediction system provides a comprehensive framework to infer privacy preferences based on the information available for a given user.

References

[1] K Strater, & H Lipford, "Strategies and struggles with privacy in an online social networking community," in Proc. Brit. Comput. Soc. Conf. Human-Comput. Interact., 2008, pp.111–119.

[2] J. Bonneau, J. Anderson, and L. Church, "Privacy suites: Shared privacy for social networks," in Proc. Symp. Usable Privacy Security, 2009.

[3] KambizGhazinour, Stan Matwin and Marina Sokolova, "Your privacy protector: A Recommender System for Privacy Settings in Social Networks", International Journal of Security, Privacy and Trust Management, August 2013.

[4] L. Church, J. Anderson, J. Bonneau, and F. Stajano, "Privacy stories: Confidence on privacy behaviors through end user programming," in Proc. 5th Symp. Usable Privacy Security, 2009.

[5] H. Lipford, A. Besmer, and J. Watson, "Understanding privacy settings in facebook with an audience view," in Proc. Conf. Usability, Psychol., Security, 2008.

[6] Anna CinziaSquicciarini, "Privacy Policy Inference of User-Uploaded Images on Content Sharing Sites", IEEE Transactions on Knowledge and Data Engineering, 27(1), January 2015.

[7] A. Acquisti and R. Gross, "Imagined communities: Awareness, information sharing, and privacy on the facebook," in Proc. 6th Int. Conf. Privacy Enhancing Technol. Workshop, 2006, pp.36–58.

[8] J. Bonneau, J. Anderson, and G. Danezis, "Prying data out of a social network," in Proc. Int. Conf. Adv. Soc. Netw. Anal. Mining, 2009, pp.249–254.

[9] A. Kapadia, F. Adu-Oppong, C. K. Gardiner, and P. P. Tsang, "Social circles: Tackling privacy in social networks," in Proc. Symp. Usable Privacy Security, 2008.

[10] R. Ravichandran, M. Benisch, P. Kelley, and N. Sadeh, "Capturing social networking privacy preferences," in Proc. Symp. Usable Privacy Security, 2009.

[11] A. Mazzia, K. LeFevre, and A. E., "The PViz comprehension tool for social network privacy settings," in ProcSymp. Usable PrivacySecurity, 2012.

[12] P. Klemperer, Y. Liang, M. Mazurek, M. Sleeper, B. Ur, L. Bauer, L. F. Cranor, N. Gupta, and M. Reiter, "Tag, you can see it!: Using tags for access control in photo sharing," in Proc. ACM Annu. Conf. Human Factors Comput. Syst., 2012, pp. 377–386.

[13] CA Yeung, L. Kagal, N. Gibbins, and N. Shadbolt, "Providing access control to online photo albums based on tags and linked data," in Proc. Soc. Semantic Web: Where Web 2.0 Meets Web 3.0 at the AAAI Symp., 2009, pp. 9–14.

[14] J. Yu, D. Joshi, and J. Luo, "Connecting people in photo-sharing sites by photo content and user annotations," in Proc. IEEE Int. Conf. Multimedia Expo, 2009, pp.1464–1467.

[15] HM Chen, MH Chang, PC Chang, MC Tien, WH Hsu, and JL Wu, "Sheepdog: Group and tag recommendation for flickr photos by automatic search-based learning," in Proc. 16th ACM Int. Conf. Multimedia, 2008, pp. 737–740.

[16] MD Choudhury, H. Sundaram, YR Lin, A. John, and DD Seligmann, "Connecting content to community in social media via image content, user tags and user communication," in Proc. IEEE Int. Conf. Multimedia Expo, 2009, pp.1238–1241.