A Study on the Privacy of User Uploaded Images on Content Sharing Sites

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ABSTRACT

With the increasing volume of images users share through social sites, maintaining privacy has become a major problem, as demonstrated by a recent wave of publicized incidents where users inadvertently shared personal information. In light of these incidents, the need of tools to help users control access to their shared content is apparent. Toward addressing this need, we propose an Adaptive Privacy Policy Prediction (A3P) system to help users compose privacy settings for their images.

We examine the role of social context, image content, and metadata as possible indicators of users' privacy preferences. We propose a two-level framework which according to the user's available history on the site, determines the best available privacy policy for the user's images being uploaded. Our solution relies on an image classification framework for image categories which may be associated with similar policies, and on a policy prediction algorithm to automatically generate a policy for each newly uploaded image, also according to users' social features. Over time, the generated policies will follow the evolution of users' privacy attitude.

We provide the results of our extensive evaluation over 5,000 policies, which demonstrate the effectiveness of our system, with prediction accuracies over 90 percent.

INTRODUCTION

Images are now one of the key enablers of users' connectivity. Sharing takes place both among previously established groups of known people or social circles (e. g., Google+, Flickr or Picasa), and also increasingly with people outside the users social circles, for purposes of social discovery-to help them identify new peers and learn about peers interests and social surroundings. However, semantically rich images may reveal content sensitive information. Consider a photo of a students 2012 graduation ceremony, for example. It could be shared within a Google+ circle or Flickr group, but may unnecessarily expose the students BA pos family members and other friends. Sharing images within online content sharing sites, therefore, may quickly lead to unwanted disclosure and privacy violations. Further, the persistent nature of online media makes it possible for other users to collect rich aggregated information about the owner of the published content and the subjects in the published content. The aggregated information can result in unexpected exposure of one's social environment and lead to abuse of one's personal information. 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. One of the main reasons provided is that given the amount of shared information this process can be tedious and error-prone. Therefore, many have acknowledged the need of policy recommendation systems which can assist users to easily and properly configure privacy settings. However, existing proposals for automating privacy settings appear to be inadequate to address the unique privacy needs of images, due to the amount of information implicitly carried within images, and their relationship with the online environment wherein they are exposed. In this paper, we propose an Adaptive Privacy Policy Prediction (A3P) system which aims to provide users a hassle free privacy settings experience by automatically generating personalized policies. The A3P system handles user uploaded images, and factors in the following criteria that influence one's privacy settings of images: _ 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' privacy preferences. For example, users interested in photography may like to share their photos with other amateur photographers. Users who have several family members among their social contacts may share with

them pictures related to family events. However, using common policies across all users or across users with similar traits may be too simplistic and not satisfy individual preferences. Users may have drastically different opinions even on the same type of images.

For example, a privacy adverse person may be willing to share all his personal images while a more conservative person may just want to share personal images with his family members.

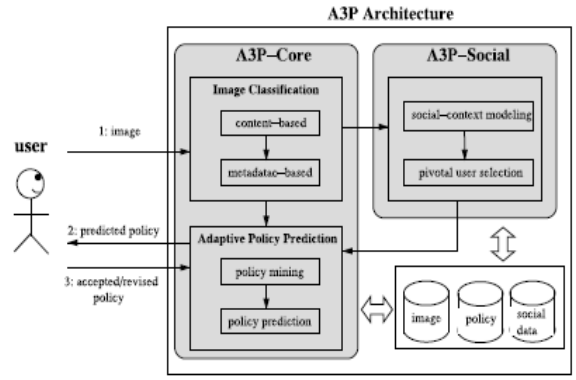


Fig. 1. System overview.

In light of these considerations, it is important to find the balancing point between the impact of social environment and users' individual characteristics in order to predict the policies that match each individual's needs. Moreover, individuals may change their overall attitude toward privacy as time passes. In order to develop a personalized policy recommendation system, such changes on privacy opinions should be carefully considered. The role of image's content and metadata. In general, similar images often incur similar privacy 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. He may upload some other photos of landscapes which he took as a hobby and for these photos, he may set privacy preference allowing anyone to view and comment the photos. Analyzing the visual content may not be sufficient to capture users' privacy preferences. Tags and other metadata are indicative of the social context of the image, including where it was taken and why [4], and also provide a synthetic description of images, complementing the information obtained from visual content analysis. Corresponding to the aforementioned two criteria, the proposed A3P system is comprised of two main building blocks (as shown in Fig. 1): A3P-Social and A3P-Core. The A3P-core focuses on analyzing each individual user's own images and metadata, while the A3P-Social offers a community perspective of privacy setting recommendations for a user's potential privacy improvement.

EXISTING SYSTEM:

- 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.
- One of the main reasons provided is that given the amount of shared information this process can be tedious and error-prone. Therefore, many have acknowledged the need of policy recommendation systems which can assist users to easily and properly configure privacy settings.

DISADVANTAGES OF EXISTING SYSTEM:

- Sharing images within online content sharing sites,therefore,may quickly leadto unwanted disclosure and privacy violations.
- Further, the persistent nature of online media makes it possible for other users to collect rich aggregated information about the owner of the published content and the subjects in the published content.
- The aggregated information can result in unexpected exposure of one's social environment and lead to abuse of one's personal information.

PROPOSED SYSTEM:

In this paper, we propose an Adaptive Privacy Policy Prediction (A3P) system which aims to provide users a hassle free privacy settings experience by automatically generating personalized policies. The A3P system handles user uploaded images, and factors in the following criteria that influence one's privacy settings of images:

- 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' privacy preferences. For example, users interested in photography may like to share their photos with other amateur photographers.

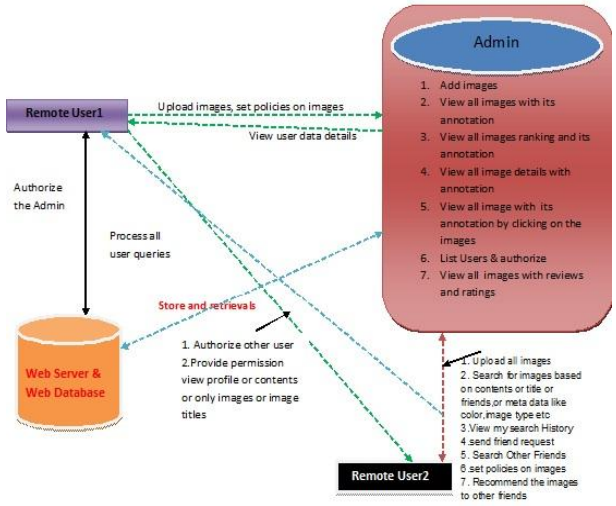
- The role of image's content and metadata. In general, similar images often incur similar privacy preferences, especially when people appear in the images. For example, one may upload several photos of his kids and specify that only his family members are allowed to see these photos.

ADVANTAGES OF PROPOSED SYSTEM:

The A3P-core focuses on analyzing each individual user's own images and metadata, while the A3P-Social offers a community perspective of privacy setting recommendations for a user's potential privacy improvement.

We design the interaction flows between the two building blocks to balance the benefits from meeting personal characteristics and obtaining community advice.

SYSTEM ARCHITECTURE:



IMPLEMENTATION MODULES:

- System Construction Module
- Content-Based Classification
- Metadata-Based Classification
- Adaptive Policy Prediction

MODULES DESCSRIPTION:

System Construction Module

The A3P system consists of two main components: A3P-core and A3P-social. The overall data flow is the following. When a user uploads an image, the image will be first sent to the A3P-core.

The A3P-core classifies the image and determines whether there is a need to invoke the A3P-social. In most cases, the A3P-core predicts policies for the users directly based on their historical behavior. If one of the following two cases is verified true, A3P-core will invoke A3Psocial: (i) The user does not have enough data for the type of the uploaded image to conduct policy prediction; (ii) The A3P-core detects the recent major changes among the user's community about their privacy practices along with user's increase of social networking activities (addition of new friends, new posts on one's profile etc).

Content-Based 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.

Our approach to content-based classification is based on an efficient and yet accurate image similarity approach. Specifically, 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-Based Classification

The metadata-based classification groups images into subcategories under aforementioned baseline categories. The process consists of three main steps. 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. The second step is to derive a representative hypernym (denoted as h) from each

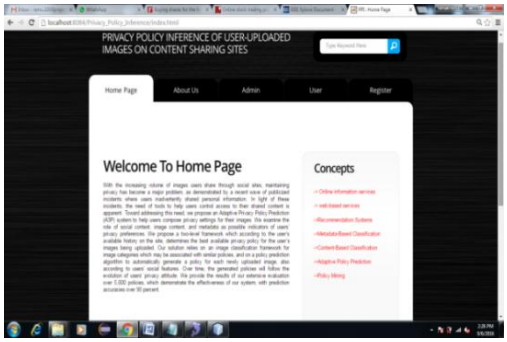
metadata vector. The third step is to find a subcategory that an image belongs to. This is an incremental procedure. At the beginning, the first image forms a subcategory as itself and the representative hypernyms of the image becomes the subcategory's representative hypernyms.

Adaptive Policy Prediction

The policy prediction algorithm provides a predicted policy of a newly uploaded image to the user for his/her reference. More importantly, the predicted policy will reflect the possible changes of a user's privacy concerns. The prediction process consists of three main phases: (i) policy normalization; (ii) policy mining; and (iii) policy prediction.

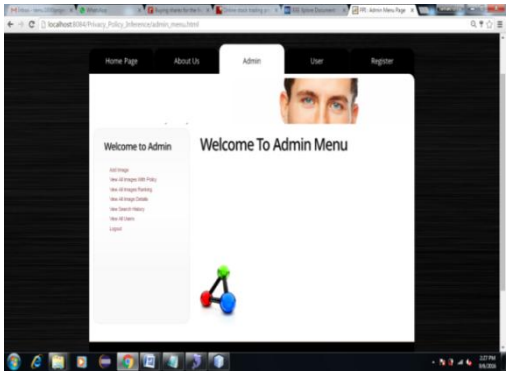
SCREEN SHOTS

Home Page:

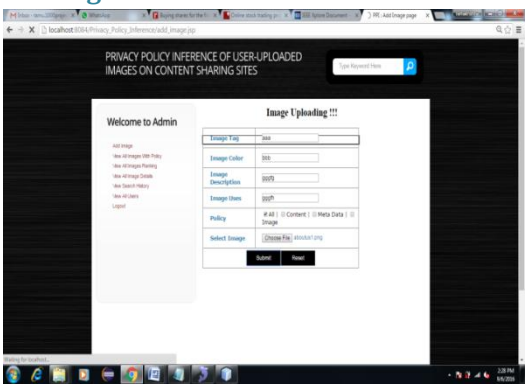


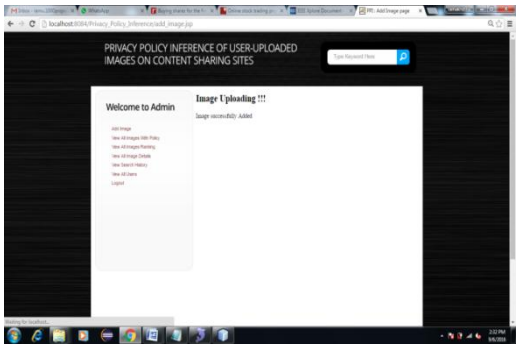
Admin Login:

Admin Home:

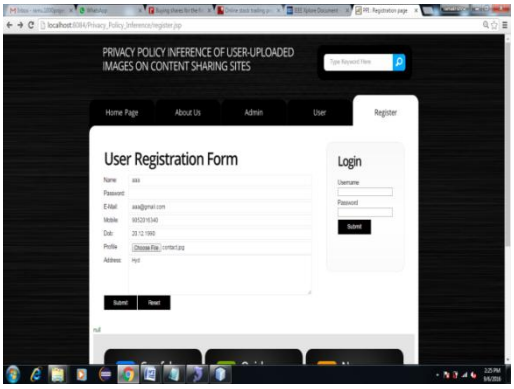


Upload Image:





User Registration& Login:



CONCLUSION

Irreversible watermarking techniques make changes in the data to such an extent that data quality gets compromised. Reversible watermarking techniques are used to cater to such scenarios because they are able to recover original data from watermarked data and ensure data quality to some extent. However, these techniques are not robust against malicious attacks—particularly those techniques that target some selected tuples for watermarking. In this paper, a novel robust and reversible technique for watermarking numerical data of relational databases is presented. The main contribution of this work is that it allows recovery of a large portion of the data even after being subjected to malicious attacks. RRW is also evaluated through attack analysis where the watermark is detected with maximum decoding accuracy in different scenarios. A

number of experiments have been conducted with different number of tuples attacked. The results of the experimental study show that, even if an intruder deletes, adds or alters up to 50 percent of tuples, RRW is able to recover both the embedded watermark and the original data. RRW is compared with recently proposed state-of-the-art techniques such as DEW, GADEW and PEEW to demonstrate that RRW outperforms all of them on different performance merits. One of our future concerns is to watermark shared databases in distributed environments where different members share their data in various proportions. We also plan to extend RRW for non-numeric data stores.

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