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My Privacy My Decision: Control of Photo Sharing on Online Social Networks

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ABSTRACT

Photo sharing is an attractive feature which popularizes Online Social Networks (OSNs). Unfortunately, it may leak users' privacy if they are allowed to post, comment, and tag a photo freely. We attempt to address this issue and study the scenario when a user shares a photo containing individuals other than himself/herself (termed co-photo for short). To prevent possible privacy leakage of a photo, we design a mechanism to enable each individual in a photo be aware of the posting activity and participate in the decision making on the photo posting. For this purpose, we need an efficient facial recognition (FR) system that can recognize everyone in the photo. However, more demanding privacy setting may limit the number of the photos publicly available to train the FR system. To deal with this problem, our mechanism attempts to utilize users' private photos to design a personalized FR system specifically trained to differentiate possible photo co-owners without leaking their privacy.

Keyword: OSNS ,Privacy, Conditional Random Field (CRF),Dynamic

1. INTRODUCTION

OSNS have become integral part of our daily life and has profoundly changed the way we interact with each other, fulfilling our social needs–the needs for social connections, information sharing, thankfulness and respect. It is also this very nature of social media that makes people put more content, including photos, over OSNs without too much thought on the content. However, once something, such as a photo, is posted online, it becomes a permanent record, which may be used for purposes we never expect. For example, a posted photo in a party may reveal a connection of a celebrity to a mafia world. Because OSN users may be careless in posting content while the effect is so far-reaching, privacy protection over OSNs becomes an important issue. When more functions such as photo sharing and tagging are added, the situation becomes more complicated. For instance, nowadays we can share any photo as we like on OSNs, regardless of whether this photo contains other people (is a co-photo) or not. Currently there is no restriction with sharing of co-photos, on the contrary, social network service providers like Facebook are encouraging users to post co-photos and tag their friends in order to get more people involved. However, what if the co-owners of a photo are not willing to share this photo? Is it a privacy violation to share this co-photo without permission of the co-owners? Should the co-owners have some control over the co-photos? To answer these questions, we need to elaborate on the privacy issues over OSNs. Traditionally, privacy is regarded as a state of social withdrawal. According to Altman's privacy regulation theory privacy is a dialectic and dynamic boundary regulation process where privacy is not static but "a selective control of access to the self or to ones group". In this theory, "clash" refers to the openness and closeness of self to others and "dynamic" means the desired privacy level changes with time according to environment. During the process of privacy regulation, we strive to match the achieved privacy level to the desired one. At the optimum privacy level, we can experience the desired confidence when we want to hide or enjoy the desired attention when we want to show. However, if the actual level of privacy is greater than the desired one, we will feel lonely or isolated; on the other hand, if the actual level of privacy is smaller than the desired one, we will feel over-exposed and vulnerable.

In our paper, the potential owners of shared items (photos) can be automatically identified with/without user-generated tags. 2) We propose to use private photos in a privacy-preserving manner and social contexts to derive a personal FR engine for any particular user.

3) Orthogonal to the traditional cryptographic solution, we propose a consensus-based method to achieve privacy and efficiency. The rest of this paper is organized as follows. In

Section 2, we review the related works. Section 3 presents the formulation of our problem and the assumptions in our study. In Section 4, we give a detailed description of the proposed mechanism, followed by Section 5, conducting performance analysis of the proposed mechanism. In Section 6, we describe our implementation on Android platform with the Facebook SDK and the extensive experiments to validate the accuracy and efficiency of our system. Finally, Section 7 concludes the paper.

2. SYSTEM STUDY

The feasibility of the project is analyzed in this phase and business proposal is put forth with a very general plan for the project and some cost estimates. During system analysis the feasibility study of the proposed system is to be carried out. This is to ensure that the proposed system is not a burden to the company. For feasibility analysis, some understanding of the major requirements for the system is essential. Three key considerations involved in the feasibility analysis are Economical feasibility ,Technical feasibility ,Social feasibility

Modules Description:

Photo privacy

Social network,

Friend list

Collaborative Learning

2.1 Photo privacy:

Users care about privacy are unlikely to put photos online. Perhaps it is exactly those people who really want to have a photo privacy protection scheme. To break this dilemma, we propose a privacy-preserving distributed collaborative training system as our FR engine. In our system, we ask each of our users to establish a private photo set of their own. We use these private photos to build personal FR engines based on the specific social context and promise that during FR training, only the discriminating rules are revealed but nothing else With the training data (private photo sets) distributed among users, this problem could be formulated as a typical secure multi-party computation problem. Intuitively, we may apply cryptographic technique to protect the private photos, but the computational and communication cost may pose a serious problem for a large OSN.

2.2 Social network:

study the statistics of photo sharing on social networks and propose a three realms model: “a social realm, in which identities are entities, and friendship a relation; second, a visual sensory realm, of which faces are entities, and co-occurrence in images a relation; and third, a physical realm, in which bodies belong, with physical proximity being a relation." They show that any two realms are highly correlated. Given information in one realm, we can give a good estimation of the relationship of the other realm. Stone et al., for the first time, propose to use the contextual information in the social realm and co photo relationship to do automatic FR. They define a pair wise conditional random field (CRF) model to find the optimal joint labeling by maximizing the conditional density. Specifically, they use the existing labeled photos as the training samples and combine the photo co-occurrence statistics and baseline FR score to improve the accuracy of face annotation. Discuss the difference between the traditional FR system and the FR system that is designed specifically for OSNs. They point out that a customized FR system for each user is expected to be much more accurate in his/her own photo collections. Social networks such as Facebook. Unfortunately, careless photo posting may reveal privacy of individuals in a posted photo. To curb the privacy leakage, we proposed to enable individuals potentially in a photo to give the permissions before posting a co-photo. We designed a privacy-preserving FR system to identify individuals in a co-photo.

2.3Friend list:

Basically, in our proposed one-against-one strategy a user needs to establish classifiers between self, friend and friend, friend also known as the two loops in Algorithm. 2. During the first loop, there is no privacy concerns of Alice's friend list because friendship graph is undirected. However, in the second loop, Alice need to coordinate all her friends to build classifiers between them. According to our protocol, her friends only communicate with her and they have no idea of what they are computing for. Friend list could also be revealed during the classifier reuse stage. For example, suppose Alice want to find but between Bob and Tom, which has already been computed by Bob. Alice will first query user k to see if ukj has already been computed. If this query is made in plaintext, Bob immediately knows Alice and Bob are friends. To address this problem, Alice will first make a list for desired classifiers use private set operations into query against her neighbors' classifiers lists one by one. Classifiers in the intersection part will be reused. Notice that even with this protection, mutual friends between Alice and Bob are still revealed to

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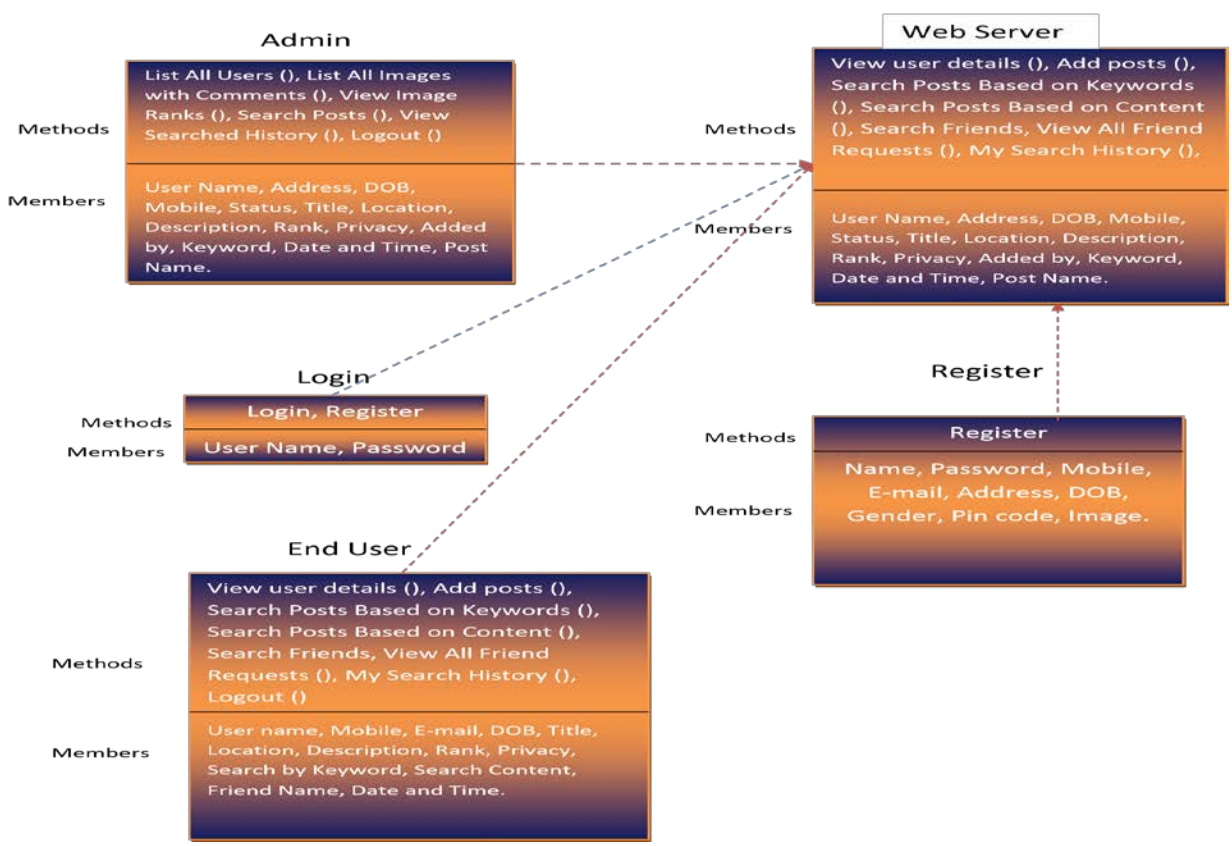
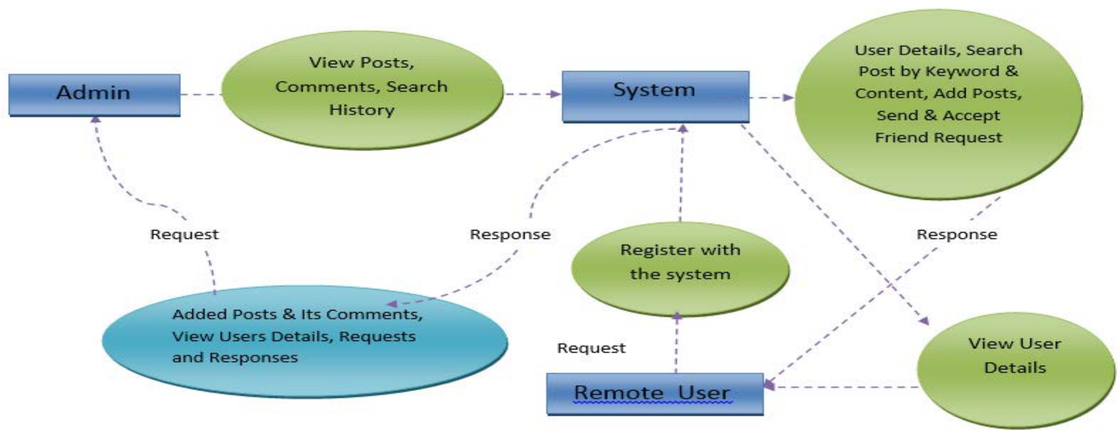
Bob, this is the trade-off we made for classifiers reuse. Actually, OSNs like Facebook shows mutual friends anyway and there is no such privacy setting as “hide mutual friends”.

2.4 Collaborative Learning:

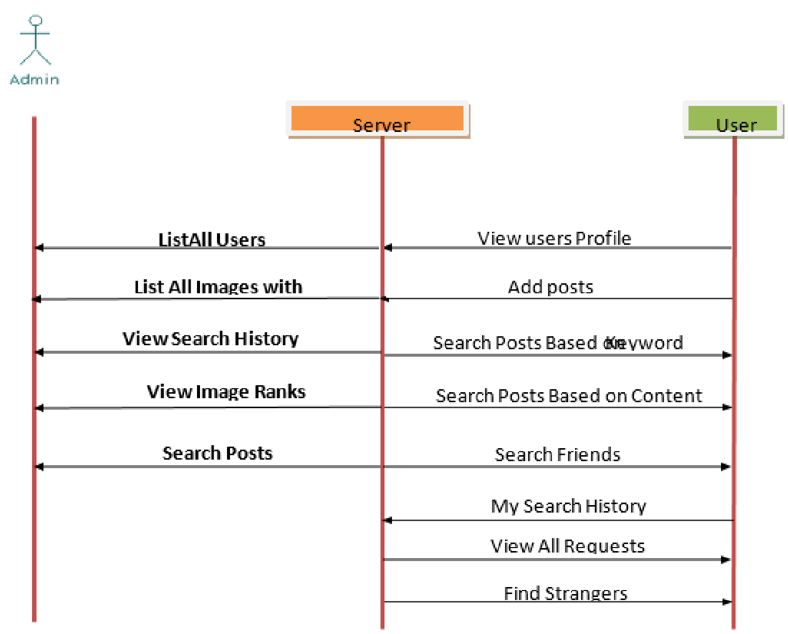
To break this dilemma, we propose a privacy-preserving distributed collaborative training system as our FR engine. In our system, we ask each of our users to establish a private photo set of their own. We use these private photos to build personal FR engines based on the specific social context and promise that during FR training, only the discriminating rules are revealed but nothing else. propose to use multiple personal FR engines to work collaboratively to improve the recognition ratio. Specifically, they use the social context to select the suitable FR engines that contain the identity of the queried face image with high probability This data isolation property is the essence of our secure collaborative learning model and the detailed security analysis. With KKT conditions and Wolfe dual, detailed iterative updates are listed in Eq



D.2.1 Class Daigram



D2.3 Module Description



3. CONCLUSION

Photo sharing is one of the most popular features in online social networks such as Facebook. Unfortunately, careless photo posting may reveal privacy of individuals in a posted photo. To curb the privacy leakage, we proposed to enable individuals potentially in a photo to give the permissions before posting a co-photo. We designed a privacy-preserving FR system to identify individuals in a co-photo. The proposed system is featured with low computation cost and confidentiality of the training set. Theoretical analysis and experiments were conducted to show effectiveness and efficiency of the proposed scheme. We expect that our proposed scheme be very useful in protecting users' privacy in photo/image sharing over online social networks. However, there always exist trade-off between privacy and utility. For example, in our current Android application, the co-photo could only be post with permission of all the co-owners. Latency introduced in this process will greatly impact user experience of OSNs. More over, local

FR training will drain battery quickly. Our future work could be how to move the proposed training schemes to personal clouds like Dropbox and/or i-cloud.

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