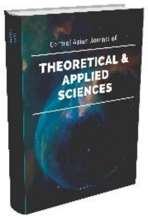

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Protection of User Profiles in Social Networks From Unauthorized Access

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Abstract: *In a social network, the user is responsible for providing the data in the form of a user profile, which is then used to identify the legitimate user. The information may consist of a person's name, age, gender, occupation, and address, all of which are stored by an organisation and kept up to date. When a user logs in, the user's username and password, which correspond to each other, are encrypted using a homomorphic encryption algorithm that has a one-of-a-kind key. The administrator gives the user a security code, which is subsequently entered into a system to verify the user's identity. The ElGamal algorithm is utilised in order to encrypt the conversation that takes place between two individuals. In addition to this, it is able to ensure the safety of user profiles by utilising numerous servers. Because there has been an increase in the number of data breaches, it is necessary for a company to investigate the possibility of implementing security protections for user profiles. As a result, we offer a solution for the organisation of profiles that makes use of a number of different encryption techniques.*

Keywords: *Matching Users Profiles, Data Protection, Social Networks, Elgamal Authentication, Unauthorized Access, Homomorphic Authentication.*

Introduction

When a user signs up for a dating site, they are usually asked to create a "profile" that other members of the site can peruse [1]. Users may be asked to provide demographic data like age, gender, educational background, occupation, marital status, number of children, religious affiliation, preferred location, drinking habits, hobbies, income, ethnicity, drug use, home and work addresses, and preferred locations

[2]. Many online dating businesses save such details in their databases even after an account has been cancelled. Without the users' awareness, their personal information may be shared again with third parties unrelated to online dating, such as advertising and data aggregators [3-7]. The user's permission is not required for this to occur. There are risks associated with using online dating services, such as being a victim of fraud, having your sexuality exploited, or having your reputation harmed [8-12].

Here is a short paraphrase of our thesis statement [13]. Before posting it to a social network, each user encrypts their profile using a homomorphic encryption technique and a common encryption key. This prevents unauthorised individuals from accessing the profile [14–19]. Therefore, even if a hacker gained access to user profiles, they could only decipher encrypted data [20]. To send a query to the social networking service provider [21-27], a user must first encrypt the desired user profile, choose a dissimilarity threshold, and then send the query. Each record in the database is checked to determine if it fits the desired user profile [28] in response to the query by a number of servers that secretly work together to share the decryption key. If the similarity level is above a predetermined threshold, the user making the inquiry is directed to the individual whose profile most closely matches their own [29–35]. First, we formally define the user profile matching model; second, we protect the privacy of user profiles; and third, we protect the privacy of user queries. Second, we offer a method for doing profile matching that is both private and satisfies a single dissimilarity criterion [36-44]. We then enhance this method to meet a broader range of dissimilarity constraints. Thirdly, we do a security analysis of our procedures. If at least one of the many servers can be trusted [45-49], then our methods can protect users' identities and the results of their queries. 4) We conduct extensive experiments on the dataset [50-53] to confirm the efficacy of our suggested approaches utilising the actual dataset across a wide range of parameter settings. The outcomes of our experiments prove the practicality and efficiency of our approaches [54].

It's a fundamental and general issue applicable to many contexts, such as while looking for a job, making new friends, or finding a romantic partner [55-59]. Current online dating services need users to submit their preferences to a server run by an unbiased third party [60]. As a result, the matching server is privy to all of the users' preferences, which poses privacy issues due to the possibility of profile leakage [61–65]. When signing up for an online dating site, members are usually asked to create a "profile" that will be visible to potential matches. Many online dating businesses keep this kind of information in their databases even after an account is terminated [66-71]. Without the users' awareness, their personal information may be shared again with third parties unrelated to online dating, such as advertising and data aggregators [72–81]. This can occur irrespective of whether or not the user agrees to it [82–95].

Literature Survey

The following research effort illustrates the originality and relevance of our study problem. The goal of this project is to write a written report that indicates familiarity with the pertinent prior research and debates on this topic [96-101]. Certain industries, such as healthcare, require the electronic transmission of private information to numerous organisations. We show how this can be done without disrupting existing databases and without compromising the organization's control over the information it stores [102–112]. We show how queries can be addressed in a decentralised manner without sending or replicating data to any trusted centralised authority, hence protecting the confidentiality of the original data [113]. We've come up with a system to help us with this. This work describes the distributed query execution engine we developed, discusses the trade-off between privacy and efficiency, and explains how to bootstrap the system with simply a real-world identity, like a name and date of birth, at the outset [114–119]. The paper also details how to bootstrap the system with simply a name and a birthdate as initial identifiers. We test the scalability of this approach via simulation [120].

Research and development on social networking applications for mobile devices has increased dramatically in recent years. Numerous systems have been developed over the past few years to compete with their Internet-based counterparts [121-127]. There are a lot of mobile solutions out there that try to do the same thing as location-aware apps: make established platforms more useful. However, the expense of mobility is sometimes the inability to reach a central server, which is necessary for popular functions like buddy discovery [128-132]. These are equally bad choices. In this paper, we describe a decentralised technique that may investigate a user's social neighbourhood by discovering mutual acquaintances [133–139]. Instead of just exploiting information about the users of the system, the solution centres on actual friends and efficiently addresses the many privacy problems that arise as a result of the use of the system [140-145]. Our cutting-edge friend-of-friend recognition technology is integrated into VENETA, a mobile social networking platform we supply. VENETA is available for no cost on the App Store and Google Play [146-151].

Every extant completely homomorphic encryption approach is based on a solution to one of three problems: limited distance decoding over the ideal lattice, approximation greatest common divisor over integers, or learning with error [152-161]. We combine the first two classes of problems in this article by defining a third class of problems that may be derived from the first two [162-169]. We present a new fully homomorphic encryption system based on the recently identified limited distance decoding issue over the hidden ideal lattice [170]. The performance of our method falls in between that of ideal lattice-based schemes [171-175] and that of integer-based systems. This is because the problem originates from the combination of the two previously described issues. We applied a lower and upper limit to the problem using our technique as a starting point. If this security hypothesis is correct, we can employ less parameters to design a system that outperforms lattice- and integer-based techniques [176-181]. As a result, our method successfully replaces current state-of-the-art ring learning methods [182-191] that rely on error-based approaches.

Biometric identification is a reliable and time-saving technology that uses a person's unique physical traits to verify their identity. To prevent the misuse, loss, or theft of biometric data [192, 194], strong privacy protections must be put in place prior to the broad adoption of biometric identification. Traditional cryptographic primitives such as homomorphic encryption and oblivious transmission provide the backbone of current solutions for protecting people' biometric privacy. These primitives always come with huge system costs and can't be used in real-world, large-scale implementations. In this study, we present a ground-breaking biometric identification system that uses cloud computing resources to safeguard user privacy while also maximising productivity. Our proposed solution is storing the biometric data in an encrypted format on servers located in the cloud. To perform a biometric identification, a credential for the candidate's biometric feature must be generated by the database owner and then stored in the cloud. Once the credential is utilised, the cloud servers execute an identification check against the encrypted database and return the result to the owner [196]. During authentication, the cloud does not have access to any of the user's authentic, private biometric data. By securely outsourcing the identifying tasks to the cloud, the owner incurs fewer real-time computing and communication costs [197, 198]. Our proposed method has been shown to be secure and to offer enhanced privacy protection compared to other methods such as key-nearest neighbour (KNN) search in encrypted databases. Real-time experiments on Amazon Cloud with datasets of varied sizes show that our computational and communication costs on the owner side are significantly lower than those of existing biometric identification systems by several orders of magnitude.

Mobile users who are in close proximity to one another engage in what is known as "proximity-based mobile social networking" (PMSN). The first step toward establishing a productive PMSN is for mobile users to settle on a set of communication partners. User selection in PMSN could benefit from the process of "profile matching," in which two users compare and contrast their profiles. However, this runs against to users' rising apprehensions about making their profiles public to people they don't know. We tackle the unresolved problem of developing novel fine-grained private matching algorithms in this study. Our methods allow users to compare and match profiles without disclosing any personal information about themselves beyond the results of the comparison.

Result and Discussion

The social interaction that takes place between mobile users who are in close proximity to one another is referred to as PMSN (short for "proximity-based mobile social networking"). The first step in creating an efficient PMSN is giving mobile users the freedom to choose their interaction partners. An intriguing possibility for user selection in PMSN is profile matching, sometimes known as two users comparing their profiles to one another. Consumers' concerns about sharing personal information with strangers are growing, and this goes against their interests. This open challenge is addressed head-on in this study by the construction of revolutionary fine-grained private matching methods. Our protocols allow for profile matching between two users without disclosing any information about either user's profile, other than the result of the comparison.

The process that a model goes through is defined in detail by the system architecture, which also helps us obtain a better overall picture of the functions that are performed by that model. The system architecture for the proposed model is laid out, and it includes specifics about the procedure that must be carried out for the execution to be successful.

A diagram that is constructed using the Unified Modeling Language is referred to as a UML diagram (UML). Its goal is to graphically portray a system together with its principal players, roles, actions, artefacts, or classes for the purpose of better comprehending, updating, maintaining, or recording information about the system. This can be accomplished through the use of a diagram.

The demonstrates the interaction of a user with a system in its most basic form. This interaction illustrates the relationship between the user and the many use cases in which the user is involved.

Interactions between objects are presented in a sequence diagram in the form of a time line. It illustrates the classes and objects that are a part of the scenario, as well as the order of messages that must be passed back and forth between the objects.

Workflows are graphical representations of processes that consist of activities and actions that are carried out in a particular order, and activity diagrams are graphical representations of workflows. Provisions for choice, iteration, and concurrent processing are also included in these provisions. They are designed to represent not only computing processes but also organisational processes (also known as workflows), in addition to the data flows that cross with the activities that are connected to carrying out the functionality of the scenario. Their purpose is to do so. In addition to this, they are supposed to model the data flows that cross with the activities that are related to it.

Activity diagrams are graphical representations of processes that include support for choice, iteration, and concurrency. Workflows are made up of sequential activities and actions. They are designed to model not only computing processes but also organisational processes (also known as workflows), in addition to the data flows that cross with the activities that are relevant to carrying out the functionality of the scenario.

The process of putting a strategy, idea, model, design, specification, standard, method, or policy into action is referred to as implementation. Implementation is the realisation of an application. The purpose of the implementation process is to design and produce (or fabricate) a system element that conforms to the requirements and/or properties specified for that element in the design. Eclipse is utilised in order to carry out the coding portion of this. The coding that must be used to apply for each of the different schemes is listed below.

When a user logs in using their username and password, the database is updated with the relevant information about that user. The homomorphic algorithm is used to encrypt the user's details, which the user is submitting, in order to improve the user's ability to maintain their privacy regarding their personal information.

An individual security code will be provided to each user by the administrator. It is the primary key that the user must input in order to access their individual profile. This will strengthen security and prevent users from accessing the system without permission.

Conclusion

In this, we have given a solution for matching user profiles while protecting the privacy of those users by employing a method of homomorphic encryption. The evaluation of the protocol's security showed that it effectively shielded user profiles from prying eyes. A social network's profile organisation can benefit from this risk-free security approach. Using a combination of homomorphic encryption techniques and many servers, we came up with an innovative approach to safeguarding user profiles. Our system allows users to find compatible people with the help of multiple servers, without disclosing the query or the user profiles. The security analyses show that the recently designed protocol safeguards both the user profile and the user inquiry. The experimental results have shown that the novel approach can be used in the real world. One of our future endeavours will be improving the speed with which parallel computation can calculate conditional gates.

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