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Recognizing malevolent Accounts in Internet-Community-Based Online Promotions

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ABSTRACT—Online casual associations persistently consolidate cash related capacities by engaging the utilization of real and virtual money. They fill in as new stages to have a grouping of business works out, for instance, online headway events, where customers can get virtual money as compensations by participating such events. Both OSNs and partners are basically concerned when aggressors instrument a great deal of records to accumulate virtual cash from these events, which make these events inadequate and achieve imperative budgetary setback. It is the destiny crucial to proactively recognizing these pernicious records before the online headway practices and right now their should be redressed. At this moment, propose a novel system, specifically practices and right now their should be redressed. At the present time, propose a novel structure, specifically Pro Guard, to accomplish this objective by deliberately joining features that portray accounts from three perspectives including their general practices, their resuscitating models, and the utilization of their money. We have performed expansive preliminaries subject to data accumulated from Tencent QQ, an overall driving OSN with worked in cash related organization works out. Preliminary outcomes have shown that our system can accomplish a high disclosure pace of 96.67% at an outstandingly low counterfeit positive pace of 0.3%.Record Terms—Online Social Networks, Virtual Currency, Malicious Accounts, Intrusion Detection, Network Security

1.**Presentation**

Online casual associations (OSNs) that facilitate virtual cash fill in as a drawing in arrange for various business works out, where on the web, natural progression is among the most unique ones. Specifically, a customer, who is ordinarily addressed by her OSN account, can get grant as virtual money by taking a premium online headway practices sifted through by business substances. She would then have the option to use such honor in various habits, for instance, online shopping, moving it to others, and in any occasion, exchanging it for veritable cash [1]. Such virtual-money engaged online headway model enables huge exertion, offers direct financial lifts to end customers, and in as far as possible the interchanges between business substances and fiscal associations. Subsequently, this model has demonstrated unbelievable assurance and expanded giant prevalence rapidly. Regardless, it faces a tremendous risk: aggressors can control a gigantic number of records, either by enrolling new records or exchanging off existing records, to participate in the on the web headway events for virtual money. Such malicious activities will on an extremely fundamental level undermine the ampleness of the progression works out, rapidly voiding the practicality of the headway theory from business substances and in the meantime hurting ONSs' reputation. What's more, a tremendous volume of virtual cash, when obliged by aggressors, could in like manner transform into a potential test against virtual money rule [2].

ccccSo as to satisfactorily recognize toxic records in online headway practices by vanquishing the recently referenced challenges, we have arranged a novel system, specifically ProGuard. ProGuard uses an arrangement of direct features to profile a record that checks out an online progression event. These features hope to portray a record from three points of view including I) its general use profile, ii) how a record accumulates virtual money, and iii) how the virtual cash is spent. ProGuard further facilitates these features using a verifiable classifier with the

objective that they can be everything viewed as used to isolate between those records compelled by aggressors and kind-hearted ones. To the extent we might know, this work addresses the primary effort to purposely recognize noxious records used for online headway development venture. We have surveyed our system using data accumulated from Tencent QQ, a primary Chinese online relational association that uses a comprehensively recognized virtual cash (i.e., Q coin), to help online budgetary activities for a mammoth gathering of 899 million powerful records. Our test outcomes have indicated that ProGuard can achieve a high area pace of 96.67% with a low sham positive pace of 0.3%. The rest of this paper is sifted through as follows. Fragment II presents the related work. Territory III rapidly discusses the establishment of virtual-money engaged OSNs. Zone IV depicts how data was accumulated and stamped. We present the structure design in Segment V and appraisal achieves Segment VI. The discussion is given in Area VII and Segment VIII wraps up.

2..Related Work

Since online casual networks accept a growing huge activity in both computerized and business world, distinguishing threatening customers in OSNs happens to remarkable criticalness. Various acknowledgment procedures have been in this manner proposed [3], [4], [5]. Considering the conspicuousness of spammers in OSNs, these methodologies just focus on distinguishing accounts that send toxic substance. A spamming ambush can be considered as an information stream began from an assailant, through a movement of noxious records, ultimately to an awful setback account. Despite the tolerable assortment of these strategies, they all around impact deficient or all of three hotspots for area including

i)the substance of the spam message,

ii) the framework system that has the toxic information (e.g., phishing substance or experiences), and iii) the social structure among noxious records and harmed singular records.

For example,organized a procedure to reveal skirmishes of malevolent records by gathering accounts that send messages with similar substance. planned a procedure to at first follow HTTP redirection chains began from URLs introduced in an OSN message, by then collected messages that incited site pages encouraged in a comparative server, ultimately used the server reputation to recognize malignant records. removed a graph from the "going with" relationship of twitter records and a short time later multiplied poisonous quality score using the decided outline; proposed a social spammer and spam message co-area technique reliant on the posting relations among customers and messages, and utilized the relationship among customer and message to improve the introduction of both social spammer acknowledgment.

Appeared differently in relation to existing methodologies on recognizing spamming accounts in OSNs, it is stood up to with new troubles to recognize dangerous records that look into online headway exercises. To start with, not exactly equivalent to spamming accounts, these records neither rely upon spamming messages nor need noxious framework establishments to dispatch ambushes. Second, social structures are excessive. Thusly, none of existing procedures is appropriate to perceiving poisonous records in online headway works out. To understand the new troubles, our system recognizes dangerous records by investigating both conventional activities of a record and its cash related activities. Recognizing counterfeit activities in cash related trades has in like manner pulled in imperative research tries . For example, addressed the customer account records in 2-dimensional space of Oneself Sorting out Guide system, and proposed a revelation methodology subject to edge type twofold portrayal computation to deal with issues of charge card distortion and communicate interchanges blackmail. situated the hugeness of distortion factors used in monetary report coercion distinguishing proof, and examined the correct plan paces of three counts including Calculated Relapse, Choice Trees, and Fake Neural Systems. proposed a corporate budgetary blackmail area procedure subject to joined features of money related numbers, phonetic direct, and non-verbal vocal. Appeared differently in relation to the concentrated budgetary blackmail acknowledgment issues, account practices of social occasion what's more, using the virtual money in online headway practices are absolutely exceptional

with standard cash related systems since they don't simply incorporate fiscal activities yet also sorting out and online progression works out. To shorten, our work intends to address another issue achieved by the new example of planning on the web casual associations and cash related activities. ProGuard incorporates new limit of interlacing features from the two frameworks organization and budgetary perspectives for acknowledgment. Before long, we acknowledge our system and existing techniques can enhance each other to improve the security of online casual networks.

3. Background Work:

In an OSN that arranges financial activities, an OSN account is generally associated with speaks to both web banking and virtual cash. Figure 1 shows such a model, where a QQ account, the most notable OSN record of Tencent, is connected with an online monetary record for veritable cash and a record for virtual money (i.e., Q coin). A customer when in doubt honestly stores authentic cash into her online budgetary record; she can empower her virtual money account from her monetary record. By taking a premium online progression events, a customer can in like manner stimulate her virtual money account by social affair pay from the headway events. A customer can expend from his records in two common manners. In any case, she can use authentic or virtual money to purchase both certified and virtual items (i.e., online shopping). Second, she can move both real and virtual cash to another customer by passing on gifts.

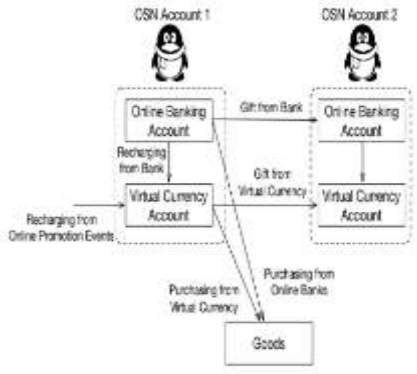

Fig. 1. The integration of OSN accounts and financial account

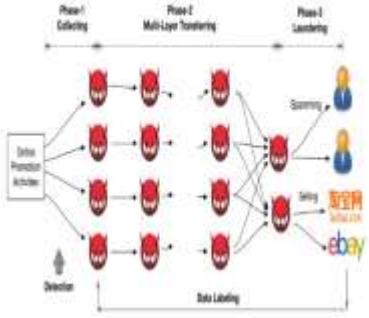

Fig. 2. Virtual Currency Flow for Malicious OSN Accounts

Figure 2 shows the common virtual money flow when toxic records look into online progression events. The flow is made out of three phases including I) gathering, ii) multi-layer moving, and iii) washing the virtual cash. In first organize, an attacker controls a ton of records to participate in online business headway practices and each record possibly gets a particular proportion of virtual cash as return. In the consequent stage, the attacker will instrument these money collection records to move the virtual cash to various records. Various layers of moving activities might be incorporated to jumble the characters of poisonous records used for sharing on the web progression works out. Around the completion of the ensuing stage, a great deal of virtual money will be amassed into several washing accounts. In the third stage, the attacker will control the washing records to trade the virtual cash into authentic cash by offering it to particular buyers. Attackers generally use two strategies to demand solitary buyers including sending spams and publicizing through noteworthy online business sites, for example, www.taobao.com and www.tmall.com. So as to contend with controlled hotspots for virtual cash (i.e., purchasing virtual money using veritable money), aggressors commonly offer a noteworthy markdown.

We will likely arrangement an acknowledgment system fit for perceiving toxic records that participate in online headway events for virtual money collection (at the variety organize) before compensations are submitted. Recognizing pernicious records at this specific time point (i.e., before the dedication of compensations and at the arrangement organize)

achieves unprecedented good conditions. In the first place, as a direct heuristic to thwart normally selected records that are presumably going to be bots, business substances generally require the taking an intrigue records to be enrolled for a particular proportion of time (e.g., a large portion of a month). Right now, distinguished and lightened toxic records can't be quickly displaced by the as of late selected records, in this manner drastically confining aggressors' abilities. On the other hand, no restriction is applied for accounts used for virtual cash moving and washing. This derives such records can be easily displaced by attackers at whatever point recognized, coming about inconsequential impact on aggressors' abilities. Second, our disclosure structure will name whether a record is dangerous when it looks into an online headway event; this enables business components to choose huge decisions, for instance, de-sort out this record from being compensated at the present time. Appropriately, it can proactively assuage the financial setback looked by business substances.

4. Data

We have assembled checked data from Tencent QQ, a fundamental Chinese online relational association that offers a variety of organizations, for instance, content, voice talk, electronic games, online shopping, and web business. All of these organizations support the utilization of the Q coin, the virtual cash passed on and administered by Tencent QQ. Tencent QQ has a goliath combination of 899 million dynamic QQ accounts with a purportedly zenith of 176.4 million simultaneous online QQ customers. Tencent QQ is one of the overall driving OSNs that are adequately drawn in with virtual money based online headway works out.

Our enlightening list is made out of 28,000 noxious records and 28,000 kind records, where these records are indiscriminately investigated from the records that looked into Tencent QQ online headway practices in August 2015. The naming technique starts from perceiving washing accounts (i.e., accounts that are connected with virtual money spams and records that sell virtual cash in huge web business destinations). Specifically, if a record moves virtual money to any record that partakes in virtual-illicit expense evasion works out, this record will be set apart as noxious. Such "traceback" strategy may incorporate various layers of moving, which is imagined at the base in Figure 2. It is significant that though both malevolent and kindhearted records are stamped reliant on their activities in Stage 2 (i.e., cash moving) and Stage 3 (i.e., washing), the data used for building the area structure are accumulated before the dispatch of the online headway event. The clarification is that the objective of our disclosure structure is to recognize poisonous records before the prizes are committed.ThetopofFigure3 presents the transient relationship among the data combination process, online headway events, and the record checking process. Thusly, it is significant that a record might not have any valid financial works out (in any occasion, for virtual money variety works out) since it partakes in the online progression for the first time.

Despite the way that the recently referenced "follow back" procedure is practical in truly checking malicious records, using it as an area system is irrational. In any case, it requires an immense proportion of manual undertakings for criminological examination, for instance, perceiving suspicious virtual-cash sellers in external online business destinations, comparing spamming content with customer accounts, and relating dealers' profiles with customer accounts. Moreover, verification for such criminological assessment will be only open after poisonous records look into online progression events. Subsequently, this data naming strategy, at whatever point used as revelation system, can't control business substances to direct their financial mishap proactively. Then again, our methodology is expected to perceive malicious records going before the prize obligation. For each record, we assemble a combination of information including 1) login works out, 2) an overview of anonymized accounts that this record has sent writings to, 3) organization purchase works out, 4) the resuscitating activities, and 5) the utilization works out.

5. Structure Plan

ProGuard is made out of two phases, explicitly the readiness organize and the acknowledgment arrange. In the readiness arrange, a quantifiable classifier is

picked up from a ton of pre-checked harmful and good records. In the recognizable proof stage, a dark record will first be changed over to a segment vector and a short time later separated by the quantifiable classifier to overview its harm. The base of Figure 3 shows the compositional audit of ProGuard. As a grouping of truthful classifiers have been made and extensively used, arranging features prepared for isolating between malicious records and kind-hearted records happens to central center intrigue. At the present time, will introduce various features and exhibit their viability on separate ng pernicious records from affable ones. We propose three general principles to coordinate the part plan.

Fig. 3. The Architectural Overview of the System

General Practices: Benevolent records are typically used by standard customers for arrangement of activities, for instance, talking, photo sharing, and financial works out. Strangely, harmful records will undoubtedly be driven by on the web progression events. Right now, kind-hearted records will when all is said in done be even more socially unique diverged from vindictive records.

Feature 1 The Ratio of Active Day

• Money Assortment: The malicious records under investigation revolve around using on the web headway activities to gather virtual cash. Interestingly, considerate clients are probably going to obtain virtual money from different resources.

• Cash Use: Assailants' conclusive objective is to adjust the virtual cash. On the other hand, thoughtful customers use their virtual cash in extensively more diversified way

A.General-Conduct Highlights Malignant records will in general be less dynamic contrasted with amiable records concerning the non-financial use. Aggressors generally control their records to simply check out online headway works out. Then again, pleasant records are bound to

B. take part in unique participation with various customers.

• Highlight 1: The Proportion of Dynamic Days. This segment addresses the extent of the amount of dynamic days of a record for the went through one year. Specifically, if a record is marked in any occasion once for a day, this day will be set apart as "dynamic" for this record. Attackers regularly login noxious records for participating in online headway practices that incorporate virtual money. Right now, records will all in all hush up without online progression works out. The openness of headway practices is significantly influenced by timing and spatial parts. For example, headway practices are heightened over exceptional seasons, one of a kind dates, and commonplace events while sometimes open for different timespans. Subsequently, poisonous records will by and large be idle generally. Generally, accommodating records are used by normal customers and their logins are driven by the consistently use, for model, talking and photo sharing. Various customers configure their applications to normally login upon the bootstrap of the basic structure (e.g., a PDA), which further energizes capriciousness of kind records. Figure 4 shows the flow of feature regards for both noxious records and kind records. As spoke to in the figure, by a long shot a large portion of dangerous records (i.e., around 98% of pernicious records) are dynamic for under 20% of full scale days however only somewhat level of kind-hearted records (i.e., under 20%) experience a comparative unique level (i.e., being dynamic for under 20% of one yea

• Feature 4 - The Average Recharge Amount of Virtual Currency.

This component addresses the ordinary proportion of virtual money for each empower paying little brain to the hotspots for restoring. Liberal customers who look into online headway practices are regularly also excited about other online cash related activities. Thusly, these accommodating customers will as a rule successfully stimulate their records. The resuscitate whole for each time by an agreeable

customer is commonly widely gigantic since customers will by and large decrease the issue of empowering. Then again, if a malignant record has been restored, the proportion of virtual cash for each empower is typically restricted by a modestly little volume offered by the online progression development. Figure 7 presents the flow of this component for kind-hearted and vindictive records, independently. Specifically, the ordinary stimulate total is higher than 1100 Chinese cents1 for over portion of kind-hearted customers, where only a little rate (i.e., around 15%) of threatening customers has a typical whole that is higher than 140 Chinese pennies. We by then consider the hotspots for stimulate. Despite a combination of potential results, we revolve around one source that is rewards from headway works out, and in like manner structure one plain as day incorporates as follows: their wealth. As a strategies towards this end, we propose three features.

Feature 7: The Percentage of Expenditure from Banks

As we have introduced, a customer can relate her financial balance with the OSN account. This record can be direct used for shopping and gifting not with standing empowering the OSN account with virtual money. Such alliance may phenomenally energize cash related activities yet realize introduction of customers' bank characters if there ought to emerge an event of law usage. Figure 10 presents the evaluation of this part reliant on this present reality data. A very little degree of toxic records expended their money from monetary adjusts. Generally, this rate is stunningly high for friendly customers (i.e., around 45%).

6.Evaluation

We performed expansive appraisal of ProGuard, which revolves around the general area precision, the essentialness of every segment, and the association among these features. For this evaluation, we used totally 56,000 records whose entire dataset is parceled into 28,000 noxious records and 28,000 good records. Such data fill in as an even dataset for setting up a quantifiable classifier

A. Identification Accuracy

We have used the institutionalized Random Forest (RF) as the quantifiable classifier for ProGuard and evaluated its recognizable proof precision. RF classifier is an outfit of unpruned plan trees, which is set up over bootstrapped trial of the primary data and the desire is made by totaling bigger part vote of the gathering. In order to avoid the inclination realized by the decision of express planning set, we too performed 10-cover cross-endorsement. Specifically, the entire dataset is divided 10 identical size sets (i.e., 10-folds); by then iteratively 9-folds are used for planning and the remaining 1-wrinkle is grasped for testing. The RF classifier was set up with 3000 trees and discretionarily inspected 4 features for all of tree separating [21]. The beneficiary working trademark (ROC) that depicts the general area execution of ProGuard is shown in Fig. 12. The test outcomes have exhibited that ProGuard can achieve high distinguishing proof precision. For example: given the fake positive pace of 0.3%, ProGuard can accomplish a high acknowledgment pace of 96.67%. For all intents and purposes, elective truthful classifiers might be grasped to render new execution points of interest, for instance, adaptability. Right now, in like manner evaluate how ProGuard performs when elective classifiers are used. As a techniques towards this end, we used Reinforce Vector Machine (SVM) and Angle Helped Treeto go over our examinations. Specifically, we used 10-wrinkle cross endorsement for all of classifiers and decided the zone under the ROC twist (AUC) , a comprehensively used proportion of nature of coordinated plan models, which is equal to the probability that a self-assertively picked trial of dangerous records will have a higher assessed probability of having a spot to threatening records than a self-assertively picked trial of ideal records. Since AUC is sans cutoff and characteristics of AUC run from 0.5 (no judicious ability) to 1.0 (incredible perceptive limit), a higher AUC of a classifier exhibits the better desire execution, free of the cutoff assurance. Table I records the AUC regards for all of the three classifiers used in the preliminaries. Both SVM and Angle Supported Tree accomplished high acknowledgment results, for all intents and purposes indistinguishable with the Sporadic Woods which has the best execution on AUC. The exploratory results

recommend that our proposed features are certainly not sensitive to the assurance of quantifiable classifiers.

TABLE 1

AUCs for Three Classifiers

Classifier	AUC
Random Forest	0.9959
SVM	0.9753
Gradient-Boosted Tree	0.9781

B. Highlight Importance and Correlation

We looked into the general noteworthiness of the proposed incorporates concerning Irregular Woods classifier, which has accomplished the best recognizable proof exactness according to our tests. We used the variable centrality of every component to the Arbitrary Woodland course of action model using stage test .The variable noteworthiness for every component.

TABLE II

Feature importance rank of Pro Guard by Random Forest

Rank	Variable importance
Feature 1	465.4
Feature 4	349.9
Feature 7	246.6
Feature 2	61.31
Feature 5	56.91
Feature 8	52.17
Feature 6	46.44
Feature 3	35.63

is figured by mean diminishing in precision, which is portrayed as a desire botch rate ensuing to permuting an every component . The situation of features reliant on the variable importance is showed up in Table II. Specifically, the extent of dynamic days (Highlight 1), the ordinary invigorate proportion of virtual money (Highlight 4), and the degree of utilization from banks (Highlight 7) address the most on a very basic level for area. It is critical that these main three features spread three comparing perspectives including the general practices, cash combination, and money use that immediate the component structure. We in like manner played out the association among various features, where the association proposes how much a component might be redundant given various features. Two for the most part grasped methodologies have been used in our preliminaries. To begin with, the upper triangular of relationship lattice is accomplished for finding if a few immovably compared features appear inside the features, where each area in the upper triangular system addresses the Pearson's r relationship coefficient of several two specific features. The Pearson's association coefficient $r \in [-1, 1]$ of two features X and Y can be portrayed as

$$r = \frac{\sum(X - \bar{X})(Y - \bar{Y})}{\sqrt{\sum(X - \bar{X})^2}\sqrt{\sum(Y - \bar{Y})^2}}$$

where $\bar{X}$ and $\bar{Y}$ show the strategies for the two features. Fig. 13 shows that most by far of features are not unequivocally related balanced another (i.e, Pearson's association coefficient $|r| \geq 0.9$). For example, a few two features, Highlight 1 (The Proportion of Dynamic Days) and Highlight 8 (The Level of Use as Endowments) addresses that the most vital negative association score is 0.07 and the most imperative positive association be tween's Component 4 (The Normal Energize Measure of Virtual Money) and Feature 6 (The Aggregate sum of Use) is 0.82. Next, we inspected Head Segment Examination (PCA), which can be used to survey variable association with regards to the distinction of the data . Figure 14 shows the exploratory outcome on PCA factors factor map . In the variable factor map, all of features is conveyed as a jolt and the point between the two electrical discharges recommends the association among the individual features on the third and fourth head parts (PC). For example, given the point between the two electrical discharges two features goes near 90 degrees,

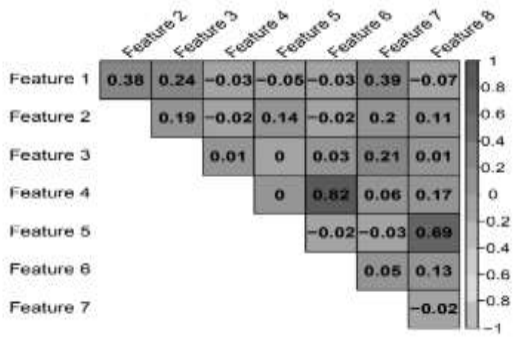

Fig. 13. Upper triangular matrix

they likely won't be associated. As can be found in Figure 14, the focuses between most of features are found proximate to 90 degrees (e.g., Highlight 3 (The Quantity of Administrations Bought By A Record) and Highlight 5 (The Level of Revive from Advancement Exercises) onto the third and fourth PCs), inducing a delicate relationship be tween's features. As demonstrated by the association system and PCA variable factor map, which show essentially nothing association with each other, we reason that larger piece of the features supplement each other given their tendency towards legitimately self-sufficiency.

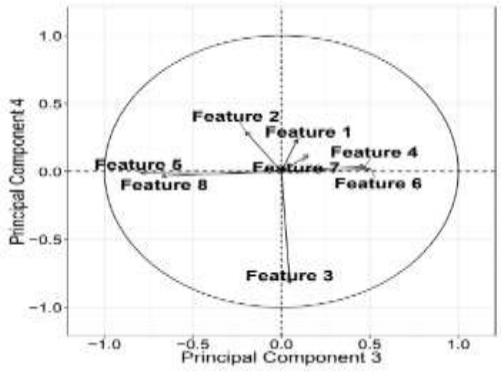

Fig. 14. The variables factor map (PCA)

7. Discussion

Attackers may try to avoid our distinguishing proof after they know the arrangement of ProGuard. This addresses a general test for all disclosure systems rather than a specific structure deformity of the proposed structure. Specifically, aggressors can instrument their records with the objective that their practices are obscure from kind records. Regardless, since ProGuard area features depict segments of malignant records that are fundamental to their accomplishment of ambushes and stealthiness against other acknowledgment structures, the productive evasion may from a general perspective oblige aggressors' capacities. For example, aggressors can out and out addition the amount of dynamic significant lots of vindictive records. Regardless, it may open malignant records to existing bot-account revelation systems that impact visit login instances of noxious records .

Aggressors can likewise increment the quantity of companions by including pernicious records as companions. In any case, this may qualify the appropriateness of numerous discovery frameworks that exploit social structures, for example, . Assailants can likewise expand the assorted variety for reviving sources, the measure of energizing, and the use from ledgers. In any case, these arrangements legitimately increment the budgetary expense for propelling the assaults, which could make assaults themselves good for nothing. Assailants may likewise endeavor to diminish the level of use as endowments, which, in any case, in a general sense confines the transfer speed to wash the gathered virtual cash.

It exists the probability that an attacker may hack some liberal records and use them to share online progression events. Regardless, hacking a great number of ideal records is genuinely not an immaterial task, which normally recommends critical cost. Besides, standard casual networks have regularly maintained convincing means to help harmed singular customers to recover their hacked accounts. In fact, it is free for any customer, including the assailant, to enroll a huge number of records, which are dedicated to productive malignant activities. In summary, aggressors have incredibly limited motivation to use hacked speaks to this kind of ambushes. Regardless, if a hacked account is actually used by an attacker for such ambushes, this record will experience mixed kindhearted and noxious lead. In case the malignant lead rules (i.e., the liberal online cash related activities are unimportant), by then we expect our system can even now distinguish this record; incredibly, if the friendly

activities orders (i.e., this record is very powerful at online money related activities), this record is most likely going to introduce a counterfeit negative. Keeping an eye on false negatives right now undeniably a huge issue and searching for incredible courses of action falls into our future work.

Considering the dynamic example of organizing OSNs with cash related limits, recognizing poisonous records that participate in suspicious financial activities happens to central criticalness. In spite of the way that the structure and evaluation of ProGuard depend on evident data accumulated from Tencent QQ, a principle OSN with 899 million unique records, the features and the revelation structure can be successfully applied to various OSNs that join money related activities. Specifically, all the proposed features rely upon essential cash related limits, for instance, invigorating and gifting. In addition, every single present feature rely upon coarse-grained information that limits security concerns, which may develop the game plan of the proposed structure in a disclosure as-organization model. Despite the way that ProGuard can effectively recognize malicious records used for social affair virtual money from online progression works out, it isn't expected for perceiving harmful records used for moving and washing virtual cash. Loosening up ProGuard to fuse such disclosure limits falls into our future work.

8. Results

9.Conclusion

This paper shows a novel system, Pro Guard, to normally distinguish poisonous OSN accounts that participate in online headway events. Pro Guard utilize three characterizations of features including general lead, virtual-money variety, and virtual-cash use. Preliminary outcomes reliant on stamped data assembled from Tencent QQ, an overall driving OSN association, have demonstrated the acknowledgment precision of Pro Guard, which has achieved a high area pace of 96.67% given an exceptionally low counterfeit positive pace of 0.3%.

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