"Review of Domain Evaluation of Trustworthiness in Online Social Networks"

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Abstract: Online Social Networks (OSNs) are a fertile medium through which users can unleash their opinions and share their thoughts, activities and knowledge of various topics and domains. This medium allows legitimate users as well as spammers to publish their content, leveraging the open environment and fewer restrictions associated with OSNs. Hence, it is essential to evaluate users' credibility in various domains and accordingly make judgements about potentially influential users in a particular domain(s). Most of the existing trustworthiness evaluation approaches of users and their posts in OSNs are generic-based approaches. There is a lack of domain-based trustworthiness evaluation mechanisms. In OSNs, discovering users' influence in a specific domain has been motivated by its significance in a broad range of applications such as personalized recommendation systems and expertise retrieval. The aim of this paper is to present a preliminary approach to evaluating domain-based user's trustworthiness in OSNs. We provide a novel distinguishing measurement for users in a set of knowledge domains. Domains are extracted from the user's content using semantic analysis. In order to obtain the level of trustworthiness, a metric incorporating a number of attributes extracted from content analysis and user analysis is consolidated and formulated considering temporal factor. The approach presented in this paper is promising since it provides a fine-grained trustworthiness analysis of users and their domains of interest in the OSNs.

Keywords-component; Domain-Based Trust, Online Social Networks, Information Retrieval, Semantic Analysis

I Introduction

Online Social Networks (OSNs) have been defined by Nepal [1] as the system compounds of certain tools, applications and platforms that sustain the online social interactions of people and communities. Examples of such web-based social media include, but are not limited to, Facebook®, LinkedIn® and Twitter®. These Web Social Networks have thrown open the doors of platforms for people to unleash their opinions and build new kinds of social interactions based on these virtual communities. OSNs provide fertile grounds for legitimate users as well as spammers to publish their content leveraging of the open environment and less restrictions which OSNs facilitate. The spamming activities in social platforms increased dramatically [2]. The spammer's activities comprise abuse in utilizing OSNs" features and tools; spammers send annoying messages to legitimate users; their contents include malicious links, and hijack popular topics [3]. Spammers post contents for various topics, and they duplicate posts [2]. Further, to propagate their vicious activities, spammers abuse other OSNs" features such as hashtags, and mention other users and Link-shortening services [4]. Various approaches for factorization of such entities have been discussed in [5]. These features can be considered as Cross-Cutting Aspects [6] in analysing OSNs. For example, since there are over 200 million active users of Twitter [7], a significant question arises regarding the quality and trustworthiness of the massive data that is being published every minute by users of such virtual environments. Sherchan et al. [8] defined Trust as the measurement of confidence where a group of individuals or communities behave in a predictable way. The significance of Trust is evident in multiple disciplines such as computer science, sociology, and psychology. Most of the current trustworthiness evaluation approaches of users and their posts in OSNs are generic-based approaches [9, 10] [11-14]. There is a lack of evaluation mechanisms that incorporate domain-based trustworthiness. In OSNs, discovering users" Influence in a specific domain has been motivated by its significance in a broad range of applications such as personalized recommendation systems [13] and expertise retrieval [15]. Domains are these areas of people"s expertise, knowledge or specialization [16]. The Semantic Web (SW) was introduced by Berners Lee who provided a new vision for the next web where data is given semantic meanings via data annotation and manipulation in a machine-readable format [17]. By incorporating semantic web technology, this resolves the issue of ambiguity of data and provides metadata which helps related data to be accurately interpreted and understood. In this paper, we incorporate AlchemyAPI 1 as a domain knowledge inference API to analyse the dataset and enrich its textual content in order to provide semantics of textual data and link each message with particular taxonomies; thus, useful knowledge will Linked Data 2 such as (DBpedia, Freebase, etc). These open RDF datasets are used by AlchemyAPI to disambiguation by incorporating annotate textual content using uri and infer its semantics accordingly

II. Objectives

1. To develop a social application like Twitter where users can tweet on any domain related updates

2. To find out a fine grained trustworthiness analysis of users and their domains of interest in the OSNs.

3. To implement data mining techniques to find user trustworthiness and re-rank the tweets depending on their likings

4. To find out users behavior, interested domains and recommend them most trustworthy people related to domains in which the user is interested

5. User can follow the recommended people to know more information related to their domains

III Literature Review

Trust evaluation in the social media ecosystem is still immature; hence, extensive research is required in this area. There are some approaches to measuring trustworthiness in social media. V. Podobnik, D. Striga, A. Jandras, and I. Lovrek, "How to calculate trust between social network users?," in Software, Telecommunications and Computer Networks (SoftCOM), 2012 proposed a model that calculates trust between friends in a network graph based on weights of the edges between user's connected friends in Facebook

M. Agarwal and Z. Bin, "Detecting Malicious Activities Using Backward Propagation of Trustworthiness over Heterogeneous Social Graph," in Web Intelligence (WI) and Intelligent Agent Technologies (IAT), 2013 IEEE/WIC/ACM International Joint Conferences on, 2013 suggested a methodology to measure the trustworthiness of a social media user by using a heterogeneous graph in which each actor in the twitter domain was presented as a vertex type in the graph. The level of trustworthiness was calculated using a backward propagation process. The paper, on the other hand, omits to consider a weighting scheme and temporal factor. Each edge type should be evaluated at different trustworthiness levels; hence, a weighting scheme should be applied. Trustworthiness values vary over time; therefore, the temporal factor should be assimilated. Authors M. Cha, H. Haddadi, F. Benevenuto, and P. K. Gummadi, "Measuring User Influence in Twitter: The Million Follower Fallacy," ICWSM, vol. 10, pp. 10-17, 2010. incorporated a number of attributes; indegree(#followers), retweets, and mentions to measure users" trustworthiness P. E. Brown and J. Feng, "Measuring user influence on twitter using modified k-shell decomposition," in Fifth International AAAI Conference on Weblogs and Social Media, 2011. adopted K-shell algorithm to measure users influence. The algorithm takes a graph of followers/following relationship as an input and evaluates the k-shell level which forms users" ranking

A. Silva, S. Guimarães, W. Meira Jr, and M. Zaki, "ProfileRank: finding relevant content and influential users based on information diffusion," in Proceedings of the 7th Workshop on Social Network Mining and Analysis, 2013 investigated the influence of social media users and the relevance of their contents in information diffusion data.

B. Tsolmon and K.-S. Lee, "A Graph-Based Reliable User Classification," in Proceedings of the First International Conference on Advanced Data and Information Engineering (DaEng-2013) work measured the credibility of Twitter users. Parameters of the Following-Ratio (#follower/#following) and Retweet-Ratio (total retweet of user/total tweets) are used to extract well-known users using the HITS Algorithm; However, they do not take the topic or subject factor into consideration; the classification has been computed in general. Users will have a certain reputation in one domain but that does not always apply to any other domain. The user"s reliability should be domain-driven. Adding a user-domain dimension when calculating trust in social media is an important factor. In this context, in our previous works we highlighted the notion of trust for the data extracted from the unstructured content (such as social media data) in order to calculate trustworthiness values which correspond to a particular user in a particular domain. The literature of trust in social media shows a lack methodologies for measuring domain-based Trust. Ontology represents the core of the domain where the knowledge is shared amongst different entities within the system that may include people or software

agents. Recent research has been undertaken to evaluate users" influence in specific topics. Authors R. Yeniterzi and J. Callan, "Constructing effective and efficient topic-specific authority networks for expert finding in social media," presented a method to discover experts in topic-specific authority networks. They applied a modified version of the HITS Algorithm for more topic specific network analysis. However, attributes such as (followers/following/friends counts, likes/favourites counts, etc) were not addressed to infer user reliability.

J. Herzig, Y. Mass, and H. Roitman, "An author-reader influence model for detecting topic-based influencers in social media," in Proceedings of the 25th ACM conference on Hypertext and social media, 2014Proposed an Author-Reader Influence (ARI) model that estimates a user content"s attraction (i.e content"s uniqueness and relevance).

In A. Bozzon, M. Brambilla, S. Ceri, M. Silvestri, and G. Vesci, "Choosing the right crowd: expert finding in social networks," in Proceedings of the 16th International Conference on Extending Database Technology, 2013the paper addresses the problem of selecting top-k expert users in social group based on their knowledge about a given topic.

The authors S. Song, Q. Li, and X. Zheng, "Detecting popular topics in micro-blogging based on a user interest-based model," in Neural Networks (IJCNN), The 2012 International Joint Conference on, 2012 built a model to discover popular topics by analysing users ,relationships and their interests. Jiyeon and Sung-Hyon analysed the flow of information amongst users of social networks to discover "dedicators" who influence others by their ideas and specific topics. Further work has been undertaken to discover experts and influential users in social networks. One of the top cited works in topic based user ranking is Twitterrank . Authors J. Weng, E.-P. Lim, J. Jiang, and Q. He, "Twitterrank: finding topic-sensitive influential twitterers," in Proceedings of the third ACM international conference on Web search and data mining, 2010 incorporated topic-sensitive Page Rank to infer topic-specific influential users of twitter. However, they did

not consider the temporal factor. Moreover, Twitterrank as well as the mentioned topic based trustworthiness approaches incorporates a bag-of words technique called Latent Dirichelet Allocation (LDA) for topic modelling. LDA is an unsupervised machine learning probabilistic model which extracts latent topics by presenting each topic as a words distribution. This statistical mechanism does not onside the semantic relationships of terms in a document . For example, Alchemy API offers a comprehensive list of taxonomies divided into five hierarchies where the high-level taxonomy represents the high-level domain and the deeper-level taxonomy provides a fine-grain domain analysis. For instance, "art and entertainment" is considered a high-level taxonomy in which "graphic design" is one of its deep-level taxonomy. LDA is unable to provide high-level topics such as "art and entertainment" from a corpus of posts or tweets unless this term exists in the corpus. Semantic analysis, on the other hand, extracts semantic concepts and infers high-level domains through analysing the semantic hierarchy of each topic leveraging ontology, which is not possible using LDA technique. Other techniques such as on-line analytical processing of graphs can be used to analyse OSNs.

IV Proposed work

We incorporate this heuristic aspect into our model to evaluate trustworthiness of users in the OSNs platforms. Consequently, we argue that a user who posts in all domains has a low trustworthiness value in general. This argument is justified based on the following facts:

There is no one person who is an expert in all domains; A user who posts in all domains does not declare to other users which domain(s) (s) he is interested in. In OSNs, a user shows to other users which domain (s)he is interested in by posting wide range of contents in that particular domain;

There is a potential that this user is a spammer due to the behaviour of spammers posting tweets about multiple topics. This could end up by tweets being posted in all domains which is not a legitimate users" behaviour. Moreover, we will try to investigate a metric incorporating a

number of attributes to measure users" behaviours in social networks. The key attributes are obtained from content and user analysis. We focus on the twitter platform as it provides a vast amount of diversity in users" contents in various domains; however, the proposed technique can be certainly applied to other social networks. In this propose work I will try to provide a fine-grained trustworthiness analysis of users and their domains of interest in the OSNs. To the best of our knowledge, in this propose work I will try the first to evaluate a knowledge-based distinguishing mechanism for users in OSNs.

In proposed work I will try to achieve following topics

• We provide a novel discriminating measurement for users in a set of knowledge domains. Domains are extracted from the user"s content using semantic analysis.

• We consolidate and formulate a metric incorporating a number of attributes extracted from content/user analysis to obtain the level of trustworthiness. We will try to provide a holistic trustworthiness approach based on three main dimensions: (i) distinguishing OSNs" users in the set of their domains of knowledge; (ii) feature analysis of users" relation and their contents; (iii) time-aware trustworthiness evaluation. Figure. 2. A Framework of the proposed approach
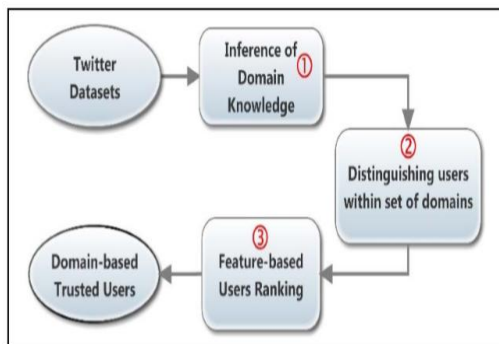

Figure 2 depicts the framework of the proposed approach. Twitter datasets will be collected using the TwitterAPI. Each tweet will pass via the domain knowledge inference module (Step1). AlchemyAPI will be incorporated in this module to infer tweets taxonomies. Users will be identified based on their tweets distribution within the corresponding set of domains in Step 2 A metric incorporating a number of attributes based on user analysis and content analysis is investigated in Step3. The output of this approach is domain-based trustworthiness users in OSNs. The following sections provide further details of the modules used in our approach.

In this context, i will try to implement AlchemyAPI which is used as a domain knowledge inference tool to analyse the twitter dataset and enrich its textual content in order to provide semantics of textual data and link each message with a particular taxonomy so useful knowledge will be inferred for further analysis. AlchemyAPI is a powerful tool and outperforms other entities" recognition and semantic mapping tools such as DBPedia Spotlight 3 , Extractiv 4 , OpenCalais 5 and Zemanta6 .

V. Conclusion

In this context I will try to evaluate a domain-based users" trustworthiness in online social network using twitter dataset. In the context of twitter, we will try to investigate a number of factors to categorise domain-based users" trustworthiness: applying semantic analysis to discover domain knowledge; a customized version of TF-IDF weighting mechanism is incorporated to reflect the importance of a user in a particular domain(s); a metric incorporating a number of attributes extracted from content analysis and user analysis is consolidated and formulate Time-aware trustworthiness evaluation is considered to analysis user"s behaviour over time.

References

[1] S. Nepal, C. Paris, and A. Bouguettaya, "Trusting the Social Web:issues and challenges," World Wide Web, pp. 1-7, 2013/08/10 2013.

[2] W. Sherchan, S. Nepal, and C. Paris, "A Survey of Trust in Social Networks," ACM Comput. Surv., vol. 45, 2013.[9] V. Podobnik, D. Striga, A. Jandras, and I. Lovrek, "How to calculate trust between social network users?," in Software, Telecommunications and Computer Networks (SoftCOM), 2012 20th International Conference on, 2012, pp. 1-6.

[3] M. Agarwal and Z. Bin, "Detecting Malicious Activities Using Backward Propagation of Trustworthiness over Heterogeneous Social Graph," in Web Intelligence (WI) and Intelligent Agent Technologies (IAT), 2013 IEEE/WIC/ACM International Joint Conferences on, 2013, pp. 290-291.

[4] M. Cha, H. Haddadi, F. Benevenuto, and P. K. Gummadi, "Measuring User Influence in Twitter: The

Million Follower Fallacy," ICWSM, vol. 10, pp. 10-17, 2010.

[5] P. E. Brown and J. Feng, "Measuring user influence on twitter using modified k-shell decomposition," in Fifth International AAAI Conference on Weblogs and Social Media, 2011.

[6] A. Silva, S. Guimarães, W. Meira Jr, and M. Zaki, "ProfileRank: finding relevant content and influential users based on information diffusion," in Proceedings of the 7th Workshop on Social Network Mining and Analysis, 2013, p. 2.

[7] B. Tsolmon and K.-S. Lee, "A Graph-Based Reliable User Classification," in Proceedings of the First International Conference on Advanced Data and Information Engineering (DaEng-2013). vol. 285, T. Herawan, M. M. Deris, and J. Abawajy, Eds., ed: Springer Singapore, 2014, pp. 61-68.

[8] K. Balog, Y. Fang, M. de Rijke, P. Serdyukov, and L. Si, "Expertise Retrieval," Foundations and Trends in Information Retrieval, vol. 6, pp. 127-256, 2012.

[9] T. Berners-Lee, J. Hendler, and O. Lassila, "The semantic web," Scientific american, vol. 284, pp. 28-37, 2001.

[10] S. E. Robertson and K. S. Jones, "Relevance weighting of search terms," Journal of the American Society for Information science, vol. 27, pp. 129-146, 1976.

[11] S. Robertson, "Understanding inverse document frequency: on theoretical arguments for IDF," Journal of documentation, vol. 60, pp.503-520, 2004.

[12] J. Weng, E.-P. Lim, J. Jiang, and Q. He, "Twitterrank: finding topicsensitive influential twitterers," in Proceedings of the third ACM international conference on Web search and data mining, 2010, pp.261-270.

[13] K.-Y. Jeong, J.-W. Seol, and K. Lee, "Follower Classification Based on User Behavior for Issue Clusters," in Proceedings of the First International Conference on Advanced Data and Information Engineering (DaEng-2013). vol. 285, T. Herawan, M. M. Deris, and J. Abawajy, Eds., ed: Springer Singapore, 2014, pp. 143-150.

[14] B. Tsolmon and K.-S. Lee, "A Graph-Based Reliable User Classification," in Proceedings of the First International Conference on Advanced Data and Information Engineering (DaEng-2013). vol.285, T. Herawan, M. M. Deris, and J. Abawajy, Eds., ed: Springer Singapore, 2014, pp. 61-68.

[15] K. Balog, Y. Fang, M. de Rijke, P. Serdyukov, and L. Si, "Expertise Retrieval," Foundations and Trends in Information Retrieval, vol. 6, pp. 127-256, 2012.

[16] B. Hjørland and H. Albrechtsen, "Toward a new horizon in information science: domain-analysis," J. Am. Soc. Inf. Sci., vol. 46pp. 400-425, 1995.