A Web-Based System for Classifying Social Network Users Using GEPHI

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Abstract – The availability of social network has increasing over the past few years, and also have more chance to perform fast marketing with the social network. The information collected from the different users is used to know the characteristics of social network users. At the same time, a large number of relationships between social network users is increased. The development of the system uses HTML5, JavaScript, PHP, AJAX and other web programming languages for their efficient Applications Programmer Interface (API). There are some of the areas for further development, they are event diary, hobbies, group page and admin control. In future, those developments are to be carried out with all the options required. Final work is classification of users, those classifications are going to be developed with the help of analyzing users behavior and their travel plan ideas shared by the users.

Index Terms – Social Network, Social Network Users, Web Programming, Gephi.

1. INTRODUCTION

Social network analysis is popularly increasing as a general methodology for understanding complex patterns of interaction. The network perspective examines actors that are connected directly or indirectly by one or more different relationships. Any theoretically meaningful unit of analysis may be treated as actors: individuals, groups, organizations, communities, states, or countries. Regardless of unit level, network analysis describes structure and patterns of relationships, and seeks to understand both their causes and consequences.

While the network concept has deep roots in anthropology and sociology standard techniques for studying the structure of social networks have been relatively recent developments. Several factors contribute to the growing popularity of network analysis in the social sciences. For one thing, the world is becoming more interdependent as reflected harsh overlapping corporate boards, international markets, specialized service economies, and the involvement of multiple levels of government in many aspects of daily life. Another factor is the applicability of network analysis across different units and levels of analysis. Network analysis is a potentially powerful methodology for connecting micro and macro levels of social theory, a third factor has been advances in computer technology which make it possible to design network studies and conduct complex network analyses which were impossible just a decade ago.

The system encourages the usage of network analysis in social network. The project performs introducing and illustrating basic features of network analysis, and by presenting a network analysis of an inter organizational network. The analysis is performed using a software package called Gephi. The software was selected because it provides the most advanced package now available for the web application.

Most sites support the maintenance of pre- existing social networks, but others help strangers connect based on shared interests, political views, or activities. Some sites cater to diverse audiences, while others attract people based on common language or shared racial, sexual, religious, or nationality- based identities.

Compared to existing approaches, the use of semantic web technologies to represent much richer forms of relationships among users, resources and actions. Semantic web technologies have been recently used for developing various policy and access control languages for domains different from OSNs.

1.1. Properties of Social Network

A social network can be defined as any bounded set of connected social units. It highlights three important characteristics of social networks.

1) Networks have boundaries. That is, some criterion exists to determine membership in the network. In some networks, such as family systems, friendship groups, and work teams, boundaries are relatively straightforward and easy to define. But social networks are also presumed to be embedded in larger social systems. Therefore, it is sometimes difficult to distinguish between a network and its broader social context. The definition of boundaries is a critical first step toward the study of social networks.

2) The second key element of the definition is "connectedness" in social networks. To be part of a social network, each member must have either actual or potential links to at least one other member of the network. These links may be direct or indirect. While some members may be peripheral in the network or almost completely isolated, each one must somehow be connected to other members if it is to be considered part of the network.

3) The third key aspect of the definition is the social unit. Network analysis can be easily applied to a wide range of social units. They can be individuals, as in the case of social support networks. But they can also be social service agencies, social institutions in local communities, or nations in the global economy. In a diverse profession like social work, social network analysis has direct applications for the study of clinical practice, social policy analysis, community organization, and organizational management.

4) Social Networking - It's the way the 21st century communicates now. Social networking is the grouping of individuals into specific groups, like small rural communities or a neighborhood subdivision. Although social networking is possible in person, especially in the workplace, universities, and high schools, it is most popular online. Because unlike most high schools, colleges, or workplaces, the internet is filled with millions of individuals who are looking to meet other people.

The Web-based social networking services make it possible to connect people who share interests and activities across political, economic, and geographic borders. Through e-mail and instant messaging, online communities are created where a gift economy and reciprocal altruism are encouraged through cooperation. Information is suited to a gift economy, as information is a non rival good and can be gifted at practically no cost.

Facebook and other social networking tools are increasingly the object of scholarly research. Scholars in many fields have begun to investigate the impact of social-networking sites, investigating how such sites may play into issues of identity, privacy, social capital, youth culture, and education.

Several websites are beginning to tap into the power of the social networking model for philanthropy. Such models provide a means for connecting otherwise fragmented industries and small organizations without the resources to reach a broader audience with interested users. Social networks are providing a different way for individuals to communicate digitally. These communities of hypertexts allow for the sharing of information and ideas, an old concept placed in a digital environment.

In 2011, HCL Technologies conducted research that showed that 50% of British employers had banned the use of social networking sites/services during office hours.

1.2. Social Network Mapping

Social network is the mapping and measuring of relationships and flows between people, groups, organizations, computers, URLs, and other connected information/knowledge entities. The nodes in the network are the people and groups while the links show relationships or flows between the nodes. Social network provides both a visual and a mathematical analysis of human relationships.

Social Networking Website project itself is a huge project comprising various features like profile updating, friend’s list organization and various other application to enhance the overall look and feel of the website. However, in the project basically working on two essential feature (Profile Management & Friends organization).

1.3. Domain Study

As of May 2014, almost three quarters (75%) of online U.S. adults use social networking sites, up from 67% in late 2012. In February 2005, just 8% of online adults used social networking sites.

Today, social networking site use is a major activity for internet users from a wide range of demographic groups. Younger adults are especially avid adopters, but social networking continues to grow in popularity for older adults as well. Six out of ten internet users ages 50-64 are social networking site users, as are 43% of those ages 65 and older. Although online seniors are less likely than other age groups to use social networking sites, adoption rates for those 65 and older have tripled in the last four years (from 13% in the spring of 2009 to 43% now).

Many of these early communities focused on bringing people together to interact with each other through chat rooms, and encouraged users to share personal information and ideas via personal web pages by providing easy-to-use publishing tools and free or inexpensive web space. Some communities - such as Classmates.com - took a different approach by simply having people link to each other via email addresses. In the late 1990s, user profiles became a central feature of social networking sites, allowing users to compile lists of "friends" and search for other users with similar interests.

New social networking methods were developed by the end of the 1990s, and many sites began to develop more advanced features for users to find and manage friends. This newer generation of social networking sites began to flourish with the emergence of SixDegrees.com in 1997 followed by Makeoutclub in 2000, HubCulture and Friendster in 2002 and soon became part of the Internet mainstream. Friendster was followed by MySpace and LinkedIn a year later, and eventually Bebo. Friendster became very popular in the Pacific Island.Orkut became the first social networking in Brazil and then also grow fast in India (Madhavan, 2007). Attesting to the rapid increase in social networking sites'

popularity, by 2005, it was reported that MySpace was getting more page views than Google. Facebook, launched in 2004, became the largest social networking site in the world in early 2009. Facebook was first introduced (in 2004) as a Harvard social networking (Cassidy, 2006).

2. DATA SOURCES AND INFORMATION EXTRACTION

Two primary open sources of social network information are newswire and social media. Various research efforts examine other sources of social network data—smart phones, proximity sensors, simulated data, surveys, communication networks, private company data, covert or dark networks, social science research, and databases.

Text information from newswire provides information about entities (people and organizations) and their corresponding relations and involvement in events. This information is encoded in text in multiple languages and numerous formats. Extracting entities and their relations from newswire stories is a difficult task. Sensors can also serve as sources of data for social networks. Smartphones and proximity devices can provide information about dynamic interactions in social networks and can aid in the corresponding analysis of those networks. Predicting behavior, personality, identity, pattern of life, and the outcome of negotiations are a few of the proposed applications that may exploit data from sensor systems.

Communications and social media have been analyzed for social network structure. For example, the release of the e-mail related to Enron's bankruptcy, and subsequent prosecution for fraudulent accounting practices, has provided a limited window into company dynamics and e-mail flow. In the case of social media, an analysis of followers in Twitter shows networks of users who are related by current news topics rather than by personal interactions. Other social media companies such as Facebook may also provide network data sources, although privacy is a major concern.

Databases can provide networks in structured form. Examples of database types include transactions between individuals (e.g., bank accounts, Paypal), collaboration or references (e.g., patent, research, movie databases), and human-annotated and human-entered data. The research described here is a database collected by the system for the Sharing the messages over the friends. This database contains people, organizations, and events annotated and categorized into a standard My Structured Query Language (MySQL) relational database structure. In addition, a database of sensor data from the reality mining corpus is used for dynamic social network analysis.

2.1. Information Extraction from Text

Information extraction (IE) is a standard term in human language technology that describes technology that automatically extracts structured information from text. A popular subarea in IE is named-entity recognition (NER). NER extracts people, places and organizations that are mentioned in text by proper name such as opposed to being referenced by pronominal terms, e.g., "you," or nominal forms, e.g., "the man".

Constructing social networks from text can be accomplished in several ways. The simplest approach is to use links based upon the co-occurrence of entities in a document. This approach can be accomplished with simple string matches or with full-scale NER. This co-occurrence approach works reasonably well with certain genres of documents (e.g., newswire reports) in which two entities mentioned together are presumed likely to be related. This approach fails for long documents that cover a wide range of topics (e.g., a survey report). For the latter case, the co-occurrence approach can be refined to narrower parameters, such as "occurs in the same paragraph, sentence, or even subject topic" of a given report.

A second approach to extracting networks is to look for mentions of relationships in text. For instance, in a document, Bob and Mary are referred to as brother and sister. This approach is compelling but has drawbacks. In many situations, relationships are implicit and not stated. The problem then becomes a process of inferring relations from text. Even with human annotators, making such inferences is a difficult task with high inter-annotator disagreement for some tasks.

A final issue in the extraction of entities from text is that of co-reference resolution. The problem arises because mentions of a name within and across documents vary—John, John Smith, Mr. Smith. Co-reference resolution combines all of these variants into one entity. However, a quick look at "John Smith" on Wikipedia shows that a name alone is not sufficient to disambiguate an entity. Co-reference resolution is difficult within documents, and across-document resolution is even harder.

2.2. Access to Information

Many social networking services, such as Facebook, provide the user with a choice of who can view their profile. This is supposed to prevent unauthorized users from accessing their information. Parents who want to access their child's MySpace or Facebook account have become a big problem for teenagers who do not want their profile seen by their parents. By making their profile private, teens can select who may see their page, allowing only people added as "friends" to view their profile and preventing unwanted viewing of the profile by parents. Most teens are constantly trying to create a structural barrier between their private life and their parents.

To edit information on a certain social networking service account, the social networking sites require you to login or provide a password. This is designed to prevent unauthorized users from adding, changing, or removing personal information, pictures, or other data.

Each of these networks allows users to list details about themselves, and also allows them to not specify details about themselves. However, these hidden details can be important to the administrators of a social network. Most of these sites are free to the end user and are thus advertising-supported. If it is assumed that advertisers want to reach the people most likely to be interested in their products, then identifying those individuals becomes a priority for maintaining much-needed advertisers. However, by just using specifically defined information, the site may be missing a large number of potentially interested users.

Taking the specified knowledge from some users and using it to infer unspecified data may allow the site to extend its target audience for particular advertisements. Of course, the implications of classification in social network data extend far beyond the simple case of targeted advertising. For instance, such ideas could be used for addressing classification problems in terrorist networks. By using the link structure and link types among nodes in a social network with known terrorist nodes, it is applicable attempt to classify unknown nodes as terrorist or non-terrorist. In such a classification process, the type of the link shared among nodes could be really critical in determining the final success of the classifier.

3. SECURITY IN ONLINE SOCIAL NETWORKS

For a detailed discussion of the use of semantic technologies in online social networks, please refer to our work in Carminati et al. (2009a). Here, we will constrain our discussions to those specific topics which impact our implementation of an access control mechanism for resources in an online social network. In the recent past, Facebook has made significant changes to its method of defining the relationships between friends on the network. Previously, if we had two Facebook users who were friends, John and Jane for instance, either John or Jane could select one of the pre-chosen friendship types that Facebook allowed, where the other friend would be required to confirm or reject this label of their friendship.

Following this, any friend of either John or Jane could see the definition that was applied to this friendship.

Now, however, instead of defining link types that are visible to others, each individual has the ability to create meaningful lists. Friends can then be added into as many lists as a user chooses. These lists can then be used to control visibility to status updates, wall posts, etc. However, there is no way to define a hierarchy of these lists. For instance, if one was to create a 'High School Classmates' and then a 'College Classmates' list, there is no way to create a 'Classmates' list, without individually adding each individual person to that third list.

We represent a friendship using the n-ary relation pattern, as specified by the W3C Consortium (1999). This means that each friendship is an instance of a class, which we call Friendship Relation. This allows us to maintain separate information about each friendship. Specifically, we maintain a Trust Value for each friendship. This allows us to determine a specific strength of a friendship, even when compared to those in the same class. Our implementation supports access control policies to regulate how resources can be accessed by the members of an online social network. In particular, the supported access control policies are defined on the basis of our previous work (Carminati et al., 2009b). Here, authorized users are denoted in terms of the type and/or trust level of the relationships between nodes in the network. For instance, an access control policy can state that the only OSN participants authorized to access a given resource are those with a direct friendship relationship with the resource owner, as long as the relationship also has a certain trust level.

Note, however, that using semantic reasoning can give some improvements over the capabilities discussed in the work by Carminati et al. (2009b). This benefit comes from our ability to specify access control policies over semantic concepts in the OSN. For example, as a default, Facebook may specify that photos can only be viewed by direct friends. In the absence of policies defined by individual users, reasoning will default to this general policy. 3.1. Filtering policies In an OSN, users can publish information of very heterogeneous content, ranging from family photos to adult-oriented contents. In this sense, the access control issues arising in OSNs are similar to those we have in the web, where the availability of inappropriate information could be armful for some users (for example, young people). To protect users from inappropriate or unwanted contents, we introduce filtering policies, by which it is possible to specify which data has to be filtered out when a given user browses the social network pages. By means of a filtering policy, it is, for example, possible to state that from OSN pages fetched by user Alice, all videos that have not been published by Alice's direct friends have to be removed.

Similar to access control policies, filtering policies are defined as rules over ontologies. This implies that policypropagation is possible also in case of filtering policies.Another relevant aspect of filtering policies is related to the user that specifies the policy (i.e., the grantor). We define two methods where a filtering policy may be created. According to the first one, a filtering policy is specified by a user to state which information she prefers not to access, i.e., which data has to be filtered out from OSN pages fetched by her. Thus, in this case the grantor and the user to which the policy applies, i.e., the target user, are the same. These policies state user preferences w.r.t. the contents one wants to access and for that reason are called filtering references. However, we also support the specification of filtering policies where the target user and the grantor are different. This kind of filtering policies makes the grantor able to specify how the SN pages fetched by target users have to be filtered. By means of these filtering policies, a grantor can supervise the content a target user can access. In this case, we refer to the filtering policy as supervised filtering policy. This

represents an extremely useful feature in open environments like OSNs. For example, a parent can specify a supervised filtering policy stating that her children do not have to access those videos published by users that are not trusted by the parent herself. As it will be clearer later on, semantic technologies greatly facilitate the specification of this kind of policies. It is worth noticing that both filtering preferences and supervised filtering policies cannot be enforced by simply supporting negative access control policies, that is, policies avoiding access to resources. This is due to the fact that access control policies and filtering policies have totally different semantics. Indeed, an access control policy is specified by the resource owner to state who is authorized or denied to access her resources. Rather, a filtering policy is specified by a supervisor for a target user or by the target user herself, to specify how resources have to be filtered out when she fetches an OSN page. Note that, according to the proposed semantics, this filtering takes place even in the case the target user is authorized to access the resource, that is, even if she satisfies the access control policies specified by the resource owner.

4. IMPLEMENTAION OF SOCIAL NETWORK

4.1. Login

Registration module provides functionalities for those people who want to open an account. Applicants can post their views with personal and professional details. They can also update the profile as frequently as required. The user can directly register and get the confirmation mail and also get the alert message from the server.

Validations are performed in the form of server side, which mostly supportive for secure authentication of social network users. Client side validation is used mostly in simple simulation level applications and websites.

An Account Details object is a helper class created whenever a new Account object is created. The object contains all the information that shows up in the user's profile. The user can edit it by modifying his/her profile. Overall, the class has no other purpose but to be a helper class to its account object.

It represents the test case of login page, which contain email, password. The testing have done with different values with validation.

4.2. Registration

When a user accesses the site for the first time, he/she must create an account before using any of the site features. The account creation process is broken into three sections. The first section deals with the login information and is required for the user to fill out. It includes the email, password, and password confirmation. The purpose behind the password confirmation is to ensure that the user didn't accidentally mistype when creating a password. The second section deals with information about who you are such as name, location, and gender. Most of these fields are optional except for your name and gender. It wouldn't be much of a social network if everyone was named anonymous. The final section deals with information about the users like and dislikes, such as interests and activities. Unlike the other two sections, it is completely optional. Once the user clicks create account, a new account, account details, and privacy settings are added to the server, and the user is brought back to the login page.

The test case of registration page contain first name, last name, email, password, confirmation password and date of birth. The testing has done with different values with validation such as alphabetic, special characters and numerical values.

4.3. Profile

All the information provided here is mandatory, if anything with the empty space, it redirects to the same page with errors, the user profile image need to resize with outside environment which can reduce the space allocation to improve the speed of the application. Profile information contains date of birth interested hobbies and more options with their own information displayed while entering into the profile.

The test case of profile page contains first name, last name, email, city, state, pincode, language, occupation and profile image. The testing has done with different values with validation such as alphabetic, special characters and numerical values.

4.4. Admin

A Privacy Settings object is the other helper class created whenever a new Account object is created. It contains all the privacy settings that a user has, such as who can view his/her media or custom pages. Admin controls the registered user access, because there is some people may upload bad information or unwanted information into the social networking site, so it will be blocked by the admin. It handles profile management page also. The class is called any time a user visits a profile or content created by another user. However, it does not directly interact with the other model classes, only the view.

4.5. Friend Request

The most important feature is being able to add and remove friends. In all Social Networking site, making friends is a fairly straightforward process. Users can type in the name of a friend in the search bar at the top of their home page. The database is queried for an account that has the search term contained in the full name, any media files with the search terms in the description, any pages with the search terms in the titles, any links with the search terms in the titles, and any notes with the search terms in the title.

For example, User A could search for User B in the search bar. After clicking on User B's profile, User A will see a button that

says Send Friend Request. Clicking on it will send an alert to User B that User A wants to be a friend. The friend request will now be in the friends list of User B, where he/she can either accept it or ignore it, letting it sit there indefinitely. If user B accepts the request, User A will be added to User B's friends list and vice versa. Being friends has its advantages. For example, only friends can chat to each other. Also, friends can view any part of a profile that is marked as friends only. Finally, for a user to view his/her friends and incoming friend requests, he/she just clicks on the friends tab which brings up a frame.

4.6. Privacy Options

Privacy is very important feature for some people, and social networking is no exception to the privacy option. The system provides three levels of privacy: open, friends only, and closed. A feature with an open privacy level is public and may be viewed by anyone. By contrast, a feature with a closed privacy level is completely private and can only be viewed by the account owner. A feature with a friend's only privacy level is fairly self-explanatory. By default, all privacy levels are set to open when a new account is created. To change privacy levels, the user can click on the options tab on the top menu bar. The current features with privacy levels are media share, account wall, user pages, notes, and the overall profile privacy.

The implementation of privacy is a fairly straightforward process. When the user makes changes to the privacy level, the Privacy Settings object in the account is updated with the new privacy settings. That working copy is then passed into the update method of the server, and that queries the database to set the record for that privacy settings object to the new values. When a user visits another profile, the profile owner is pulled from the database. A function called able to view page is passed the profile owner, the viewer profile and the page type. In the function the privacy settings object is pulled from the viewer profile and the page type determines which privacy setting is pulled from the object. If the setting is open, the function automatically returns true. If the setting is friends only, the function only returns true if the viewer profile is a friend of the page owner or if the viewer profile and the page owner are the same. Finally, if the setting is closed, the function only returns true if the viewer profile is the page owner. Once the function returns its answer the page will either do one of the things. If the function returns true, the viewer is allowed to view the page, and it will load normally. If the function returns false, the viewer is not supposed to view the page, and it will redirect to an error page.

5. EXPERIMENTAL SCENARIO

Gephi is an open source software for the visual exploration of networks. While various software exist to visualize and analyze networks, Gephi is particularly suited for networks with node properties, which is the kind of networks usually available in BI. Properties are key-value pairs associated to each node or each link. For example, members of a social network may have attributes such as gender, language, and age.

Gephi software is generic. Any kind of network can be analyzed, like communication (e.g. email) and financial networks, OSN (e.g. Twitter, Facebook), data center networks (i.e. connections between machines), document networks, and more. Gephi has been designed to facilitate the non-linear process of information discovery. In particular, it is focused on the visualization of the network using node-link diagrams, real-time interaction with data, and the building of a visual language.

Table 1: Example of company data.

sales rep.	sales vol.	status	recruiter	products
John	3500	Executive		A
Carla	18000	Manager	John	A,B
Simon	1040	Associate	Carla	
Celine	7300	Associate	John	A,B
Winston	24000	Manager	Diana	A
Diana	2700	Associate	Carla	

This language makes use of colors and sizes to create informative visuals, which aim at being the network equivalent of geographical maps.

A typical visual analysis with Gephi follows the well-established mantra of Visual Information Seeking:"Overview First, Zoom and Filter, Details-on-Demand". The objective is to reveal visual saliencies of interest for the analyst, i.e. elements which perceptually stand out from the remainder of the elements and grab the attention of the observer. Such saliences may challenge current hypotheses and raise new questions. The analyst then changes the visualization accordingly, to eventually select a picture which clearly reveals an issue, or which supports a hypothesis.

In Gephi, users have to interact with the visualization in real-time to position nodes in a two or three dimensional space using layout algorithms, or by manually moving nodes. They use node properties to change their colors and sizes, in order to find groups and detect significant nodes.

The goal is to study the correlation of node properties and network structure by using visual patterns. Classic data mining algorithms of Social Network Analysis, such as the Louvain community detection algorithm, or the betweenness centrality measure, can be computed at any time and their results integrated in the visualization through visual features. The network can also be filtered according to nodes and links properties.

The strengths of Gephi are its real-time visual feedback, performance, code modularity, and community of developers

and users. The Gephi user interface is focused on the creation of network visuals in real-time. The key innovation is to ease the interaction with the network, as users can literally play with its visual representation. By playing, we mean experimenting various visual configurations to see the outcome of any action instantaneously, for instance by playing with force-directed layouts to shape the network structure. Such algorithms are usually described as spring embedders due to the way the forces are computed.

These layouts rely on a physical metaphor to position the nodes according to the position of the others. Roughly speaking, connected nodes tend to be closer, while disconnected nodes tend to be more distant. More precisely, they compute repulsive forces between all nodes, but also attractive forces among adjacent nodes. Each layout iteration calculates the forces applied on each node, and updates its position. The visualization is refreshed at each iteration, thus providing real-time feedback to users. Some layouts are implemented with no stopping condition. Users can thus tweak the layout parameters in real-time until they decide to stop its execution. Interaction while calculating layout is made technically possible by using multi-threading processing, and by using the GPU for rendering the visualization.

6. CONCLUSION

Social networks comes in different forms and structures. The processed work has successful registration and signup options which are the starting stage of the web application. The existing users able to login directly using their authentication values. Which is used to join a user as a member in social network website. The profile information has personal information about the user. The index page having their options with their specified menu options. Users are allowed to join any hobbies and they are able to make travel plan, which is searchable by any user.

The social network enables a better understanding of the groups and organizing online users. Social network have illustrated different structures of connection around different kinds of topics. The classification technique uses Gephi to classify the social network. While developing the system a conscious effort has been made to create and develop a software package, making use of available tools, techniques and resources that would generate a proper system for Online Social Networking.

There are some areas need to develop in the system. The areas are event registration where members can create event of personal and public festivals and hobbies need to develop as to share the message etc and share events with their friends through SN website. Finally the future development is classification of users, which is going to be developed by analyzing user's behavior and their travel plan ideas shared by the users.

REFERENCES

[1] F. Angel, B. Sergio, G.R. Pablo and P. Antonio, "A Web-Based System for Classification of Remote Sensing Data," IEEE Journal of selected topics in applied earth observations and remote sensing, Vol. 6, No. 4, 2013.

[2] Asmita Joshi, J. S. Sodhi, "Attributes Similarities Supports Profile Matching in Social Network," International Journal of Engineering Sciences & Emerging Technologies, 2013.

[3] W. Feng, W. Haiyan, X. Kuai, W. Jianhong, J. Xiaohua, "Characterizing Information Diffusion in Online Social Networks with Linear Diffusive Model," IEEE 33rd International Conference on Distributed Computing Systems, 2013.

[4] Abhishek Singh and A. K. Agrawal, "An Improvised Model for Identifying Influential Nodes in Multi-Parameter Social Networks," pp. 25–30, 2014.

[5] Kondra Mohan Raju, E. Madhukar, "Classification of Users in Online Video Social Networks," International Journal of Innovative Technology and Exploring Engineering, Vol. 3, No. 7, 2013.

[6] T. Shaojie, Y. Jing, M. Xufei, L. Xiang-Yang, C. Wei, D. Guojun, "Relationship Classification in Large Scale Online Social Networks and Its Impact on Information Propagation," IEEE INFOCOM Conference On Computer Communications, 2011.

[7] H. Raymond, K. Murat, T. Bhavani, "Social Network Classification Incorporating Link Type Values," National Science Foundation Grants Career, 2014.

[8] J. Long, C. Yang, W. Tianyi, H. Pan, V. V. Athanasios, "Understanding User Behavior in Online Social Networks: A Survey," IEEE Communications Magazine, 2013.

[9] B. Andrea, H. Tom, H. Ben, C. Annette, "Workplaces and Social Networking The Implications for Employment Relations," Acas research publications, 2010.

[10] C. C. Ka, B. M. Mary, D. Christina and M. B. Rebecca, "Development of a Web-Based Social Networking System for Self-Management of Diabetes Mellitus," The International Journal of Multimedia & Applications, Vol.5 , No. 6, 2013.

[11] B. Fabricio, R. Tiago, C. Meeyoung, A. Virgilio, "Characterizing User Behavior in Online Social Networks" , International Conference On Instrument Measurement Component, pp.46 - 72 2009.

[12] C. Barbara, F. Elena, H. Raymon, K. Murat, T. Bhavani, "A Semantic Web Based. Framework for Social Network Access Control," Computer Security, Elsevier, 2011.

[13] V. Bimal, P. Ansley, "An Analysis of Social Network-Based Sybil Defenses", ACM, 2010.

[14] R. Azarias, S. Sam, T. Mitul, L. Anita Lillie, N. Brian, "Social networking in developing regions," ICTD Atlanta, ACM, 2012.

[15] S. Salvatore, N. Anastasios, L. Renaud, M. Cecilia," Socio-spatial Properties of Online Location-based Social Networks," Fifth International AAAI Conference on Weblogs and Social Media, 2011.

[16] G. Ralph, A. Alessandro," Information Revelation and Privacy in Online Social Networks," ACM Workshop on Privacy in the Electronic Society (WPES), 2005.

[17] Christo Wilson, Bryce Boe, Alessandra Sala, Krishna P. N. Puttaswamy, and Ben Y. Zhao, "User Interactions in Social Networks and Their Implications,", 2009.

[18] Joe, M. Milton, and Dr B. Ramakrishnan. "A Survey of Various Security Issues in Online Social Networks." *International Journal of Computer Networks and Applications* 1.1 (2014): 11-14.

[19] Joe, M. Milton, B. Ramakrishnan, and R. S. Shaji. "Prevention of Losing User Account by Enhancing Security Module: A Facebook Case." *journal of emerging technologies in web intelligence* 5.3 (2013): 247-256.

[20] Joe, M. Milton, and B. Ramakrishan. "Enhancing Security Module to Prevent Data Hacking in Online Social Networks." *Journal of Emerging Technologies in Web Intelligence* 6.2 (2014): 184-191.