



## **SOCIAL NETWORK ANALYSIS: PAST PRESENT & FUTURE TRENDS**

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**Abstract:** *A social network is a group of people or organizations or other social entities connected by set of social relationships such as friendship, co-working or information exchange. Social network analysis focuses on the analysis of the form of relationships among people, organizations, states and such social entities. In this paper, evaluation of past, present & future trends of social network analysis was done.*

**Keywords:** *social network analysis, social network models, social network data, future trends.*

### **I. INTRODUCTION:**

A social network is a social structure made up of individuals called nodes, which are tied by one or more specific types of interdependency such as friendship, kinship, common interest, dislikes, beliefs.

Social network analysis scrutinizes the structure of social relationships in a group to uncover the informal connection between people. Social network analysis is based on an assumption of the importance of relationships among interacting units. It indicates the way in which they are connected through different social familiarities ranging from casual acquaintances to close familiar bonds.[1]

However, a drawback of such information overload is sometimes evident in users inability to find reliable information of use to them at the time of need. Social media sites are already so deeply embedded in our daily lives that people rely on them for every need, ranging from daily news and updates on critical events to entertainment, connecting with family and friends, reviews and recommendations on products/services and places, fulfilment of emotional needs, workplace management, and keeping up with the latest in fashion, to name but a few.[2]

When we refer to social media, applications such as Facebook, WhatsApp, Twitter, YouTube, LinkedIn, Pinterest, and Instagram often come to mind. These applications are driven by user-generated content, and are highly influential in a myriad of settings, from purchasing/selling behaviours, entrepreneurship, political issues, to venture capitalism (Greenwood and Gopal 2015).[3]

### **II. PAST OF SOCIAL NETWORK ANALYSIS**

The summary of the progress of the social networks and social network analysis has been written by Linton Freeman[4]. Much early research in network analysis is found in educational psychology, and studies of child development.

Network analysis also developed in fields such as sociology and anthropology. At the turn of the 20<sup>th</sup> century, Simmel was one of the first scholars to think in relatively explicit social network terms. He examined how third parties could affect the relationship between two individuals—and he examined how organizational structures or bureaucracies were needed to coordinate interactions in large groups.

In 1979, Tom Truscot and Jim Ellis of Duke University created Usenet to create a global forum for Internet users to publish public messages. Twenty years later, Bruce and Suleene Abel founded the Open Platform, a social networking site in the first logbook[5]. The word "weblog" was created at the same time and was called "block" a year later. Increasing the speed of access to the internet has contributed to the popularity of ideas that led to the creation of social networking sites such as MySpace (2003), Orkut and Facebook (2004). This is the turn of the word "social media". Social networking sites allow people to maintain their relationships, engage with acquaintances, and create new relationships with others based on shared features such as community, interests and interests.

### **III. PRESENT OF SOCIAL NETWORK ANALYSIS:**

Social networks can be classified on the dimensions of self-presentation/ self-disclosure and social presence media richness. It can be seen that with respect to social presence and media richness, blogs and collaborative projects score the lowest as they present simple text interfaces leading to simple exchange, whereas content communities like YouTube and social networking sites like Facebook, in addition to text based communication also allow for posting of videos, photos. On the highest level are the virtual games and virtual social worlds which allow face to face interaction in 3-D space leading to sophisticated user interaction. Similarly, moving on the dimension of self presentation, blogs score better than collaborative projects as the latter focuses on content specific domains.[6]

On the same lines social networking sites, virtual social worlds allow for more self disclosure.



Each of the social media can be briefly explained as follows:-

**Content Communities:-**The main objective of content communities is the sharing of media content between users. Content communities exist for a wide range of different media types, including text (e.g. Book crossing), photos (e.g. Flickr), videos (e.g. YouTube), power point presentations (e.g. SlideShare)

**BLOG:-** A blog (a shortened version of “weblog”) is an online journal or informational website displaying information in reverse chronological order, with the latest posts appearing first, at the top. It is a platform where a writer or a group of writers share their views on an individual subject. The most effective and interesting blogs allow readers to engage in conversations with the author and other readers. (e.g. word press, twitter).

**Social Networking Sites:-** Social networking sites are websites that connect people. In these online communities, people can join for free and can establish a page with their profile. The most popular sites, such as Facebook and MySpace, also have groups, which helps to communicate with other members of the groups by chatting or calling. Members can share comments, links, photos, videos, and more.

**Collaborative Projects:-**They enable the joint and simultaneous creation of content by many end-users. Wikis are a type of collaborative application which allows users to add, remove, and change text-based content.

**Virtual Game worlds:-**Virtual worlds are platforms that replicate a three dimensional environment in which users can interact with each other as in real life. They provide the highest level of social presence and media richness of all the applications and are thus the ultimate manifestation of social media.

**Virtual social worlds:-**A virtual world is an interactive simulated environment that allows multiple users to participate simultaneously via an online interface and has the following characteristics[5][7]. They provide shared space to many users for participating simultaneously. Interaction takes place predominately in real time and allows users to build, develop and submit customized content. (e.g. Disney’s Toon town).

The dramatic growth in social multimedia and user generated content has revolutionized all phases of content value chain and has given rise to a new rapidly evolving research field. Social multimedia computing in which all well established

computing and multimedia technologies are brought together with emerging social media research.[6][7]

#### IV. FUTURE OF SOCIAL NETWORK ANALYSIS:

##### *Social Networks Analysis: Techniques*

Social Network Analysis can be termed as an application of Web Mining techniques with the focus on web content mining, web structure mining and web usage mining[8]. Mining techniques can further be considered as an application of data mining techniques such as graph mining, rule mining, link mining, clustering and classification.

Social networks are said to have evolved in sixties, with the history deep rooted in social sciences, when Milgram and Travers[8] proposed “The Small World Problem”. Social Networks are characterized by three prominent key features i.e.-

(i) “Small World Effect”

(ii) “Scale Free Distributions”

(iii) “Emergence of a community structure”

“Small World Effect” puts into evidence that there exists a relatively short path connecting any pair of nodes within the network[9]. Another important feature of Social Networks is the degree distribution of nodes within the network which specifies how the nodes within a network are interconnected. In particular, many large scale networks like World Wide Web[9], Internet follows power law and are free from any characteristic scale and hence are called scale free networks.

Another important feature is the Emergence of community structure where some nodes within the network are densely connected with respect to the rest of the nodes.

Several studies have been conducted in order to investigate the community structure of real and Online Social Network[10]. Many aspects of social networks are best understood by the process of “Visualization” which presents a graphical view of the network. Many tools are available today for visualization.

The research on community detection algorithms which is a problem of considerable practical interest and has received great deal of attention[5][6][7] and will be a subject of interest in this paper.

The aim of a community detection algorithm is, to divide vertices of a network into groups, while maximizing the number of edges between the groups and minimizing the



edges established between vertices in different groups where each group represents the desired community. The aim of detecting communities should be governed by the user's interest i.e. what kind of communities a person is interested [11]. Keeping this in view the search for community can be described as follows:-

**Density based:** The community can be described as a group in which there are many edges between groups than the edges connecting different groups.

**Vertex similarity based:** The communities may be assumed by comprising of group of vertices that are similar to each other. The similarity between each pair of vertices can be computed with respect to some reference property.

**Action based:** The approach centers around the concept of grouping entities by the set of actions they perform.

**Influence propagation based:** According to this approach, the users that frequently perform the same action due to influence of a particular user are considered as a part of same community.

## V. CHALLENGES IN SOCIAL NETWORK ANALYSIS

Social Networks are changing and evolving in the real world. New members join the network, some existing members may quit the network or change their associations and collaborate with new communities or groups. Thus social networks have an element of dynamism associated with them. As the penetration of social network is increasing in our lives, so is the interest of researchers in this field as many interesting areas of research have emerged. However, there are certain challenges associated with this area, some of which are listed in below:-

Availability of live/ Dynamic data has been a desire for researchers. Indeed, dynamic data are very difficult to collect and analyze. Many researchers have been sharing their datasets on the web, however, these datasets are static and cater to specific problem and the availability of live data from many social networking sites like facebook poses certain restrictions.

Community discovery is an important problem in social network analysis (SNA), where the goal is to identify related groups of members such that intra-community associations are denser than inter-communities associations [12]. Many researchers have been actively working in the area of dynamic community detection. One of the new areas that has been of interest is topic based community discovery which aims to

compute community structure by considering the user involvement in a particular topic on community.

Spam detection and advertisement detection are research challenges that need extra attention from the research community. Since users and data production increase, spam (irrelevant information) and advertisements will continue growing [11][12].

Security by means of Social Networks Analysis is the information that is extracted from Social Networks analysis has proved to be a useful tool towards security. One example of an application related to security is the Analysis of terrorism, as for instance, the Analysis of the 9-11. This study was done by gathering public information from major newspapers on the WWW and analyzing it by means of Social networks. Further, many researchers have emphasized the use of techniques for social network analysis in discovering hidden groups, identifying key nodes in terrorist networks [30], detecting cyber crimes. Recent trends have shown that social networking sites are used by extremist groups for spreading propaganda, hatred, recruitments etc. So, there is a growing need to monitor/track/detect extremist groups active on various social networking sites. An important application of social network analysis techniques combined with the use of text mining approach can be used to detect communities of extremist groups engaged in serious conversations, propagation of their ideas. Thus we can say topic based cyber crime detection in real world is another area of concern. However, the problem requires a dynamic and less complex solution as the active groups may not tend to operate in large numbers in a social networking site.[13]

CrimeNet Explore [14] is a system for Criminal Network knowledge discovery that incorporates several techniques including the concept of space approach, hierarchical clustering, social network analysis and multidimensional scaling. However, the systems does not caters to incorporate dynamic characteristics of criminal networks. Hence, Dynamic Analysis of Criminal Networks is again an ongoing research area.

The increasing use of social networks by masses have given way to cyber criminals known as hackers/ hacking groups which use these sites for spreading botnets. Thus an important aspect of security is detection of botnets in online social networks.

J.Qiu and Z. Lin [15] in their research efforts have described the use of community tree data structure to represent organizational structure and presented a framework for



exploring organizational structure in dynamic social networks. However, the development of time effective and optimized solution for dynamic social network analysis is the need of the day and thus emerges as a challenge.

There is vast amount of unstructured data available over the internet which if linked with open source data and social network data, can present a new fold research outlook resulting in development of brilliant mining techniques / framework which can be further incorporated to develop a socio-semantic analyser to draw out effective hidden information. This finds its linkages and applications to the semantic web.

## VI. CONCLUSION

Real World Social networks and the online communities have evolved as an exceptionally useful collaborative and communication tools for millions of users. As the penetration of the social networks in our lives increase, we may see abuse as well as the benefits of the technology in future. In this paper we have tried to present an overview of social networks with an overview of the techniques used in the analysis of social networks. We have also tried to discuss the challenges and the emerging research areas associated with the analysis of social networks.

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