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Research Article

A STUDY ON SNA: MEASURE MODULARITY OF KNOWLEDGE DIFFUSION IN GEPHI

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Abstract

Social Media is a term that covers the platforms Facebook, twitter, blogs and other things typically thought of as social networking. ONS's are primarily Internet based tools for sharing and discussing information among human beings. In this paper focuses mainly to study social network parameters commonly used to explain social structures.

In this paper, we extract academic researcher data from an academic social network, analyze and evaluate network parameters on some widely recognized graph topology using GEPHI social network tool. Using these parameters we find out the strength of research spectrum, authors contribution in academic knowledge diffusion.

In this research work we have collected this data set from ArnetMiner (http://www.arnetminer.org). In this massive real time dataset we have taken co-author training set randomly it contains 100 records from the 4258615 records. We measure modularity of research community.

This research community we identified collaborations of authors and co authors published in research article using gephi tool we find out the maximum and minimum research community groups in the academic knowledge diffusion.

Keywords: Graphs, edges, lines, arcs, modularity.

I. Introduction

A graph is *vertices*, *nodes*, or *points* which are connected by *edges*, *arcs*, or *lines*. Simple graph - does not have loops (self-edges) and does not have multiple identical edges. Simply we define graphs are connections of vertices and edges.

We don't consider graph shape, we consider only nodes are connected or not. An edges connected two vertices.

Two types of edges :

1. Symmetrical,

2. Arcs (Directed).

Two types of graph frameworks:

1. Graph,

2. Digraph.

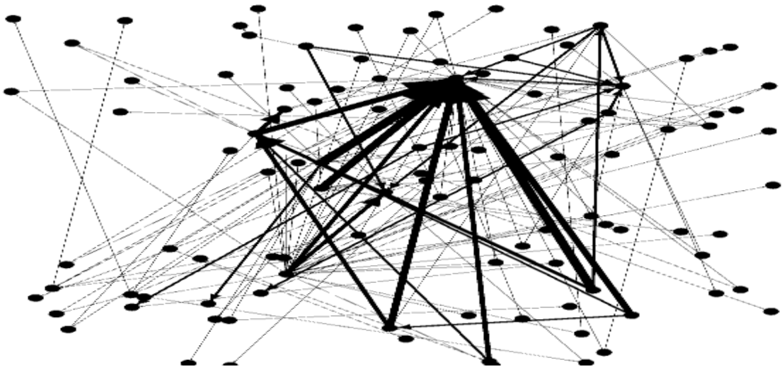

Fig1: Cluster of Research community without Label Representation

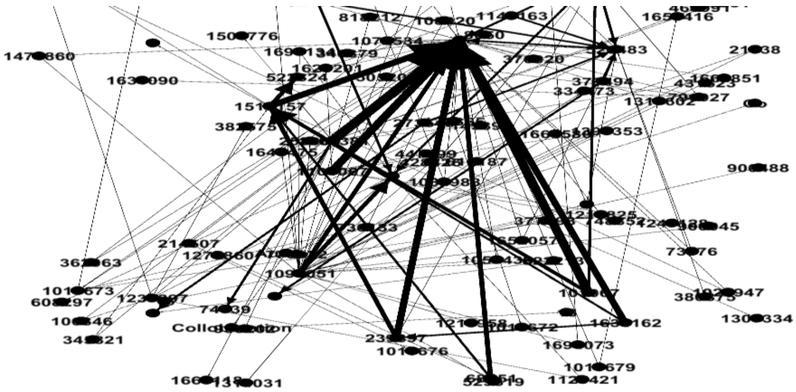

Fig2: Cluster of Research community With Label Representation

II. Related Work

Dynamic network analysis can provide an aid to longitudinal SNA research. However, as a relatively young field, many aspects have not been explored and there are few standards that have been established.

One path taken was to treat network edges as probabilistic, and use multi agent systems to study network evolution (Carley 2003). Carley redefined the traditional sociogram by adding probabilistic parameters on the edges, providing a quantification of the likelihood they will form. Individual nodes were also given more emphasis; they are treated as agents, and can potentially impact how a network will develop. Terroist networks are a good example where prediction is vital (Krebs 2002), and one in which link prediction has important applications(Carley, Dombroski, Tsvetovat, Reminga and Kamneve 2003; Liben-Nowell and Kleinberg 2006).

Another visualization method is to explicitly use the time and order of social interactions to build the network (Berger-Wolf and Saia 2006). Researchers have also applied DNA methods to study other forms of longitudinal networks. Kossinetts and Watts(2006)examined the stability of bridges, defined as connections outside one's circle of acquaintances, and measured how social ties were created and dissolved over time. Barabasi and colleagues (2002)applied DNA methods to find unique properties in an evolving citation network that differed from classic models. Indeed, various forms of citation and co-authorship networks offer a wealth of reliable data with which to study the evolution of networks. New layouts and metric computations are constantly being developed from these dynamic network studies (Brandes and Pich 2012).

The study of dynamic networks greatly benefits from visualizations that can illustrate ideas and concepts not immediately visible in a static sociogram. In fact, "The ability to see data clearly creates a capacity for building intuition that is unsurpassed by summary statistics" (Moody, McFarland and Bender-deMoll 2005). Moody and others' research emphasizes how the ability to see data can be superior to summary statistics, and illustrates the need to visualize how networks develop and change over time. Additionally, they lay the foundation of how dynamic network visualizations should be presented (e.g. differentiating between discrete and continuous time), and recommend visualization and analysis be interactive. These theoretical ideas were developed in parallel with SoNIA, a software package for visualizing dynamic network data (Bender-deMoll and McFarland 2006).Other researchers have continued to focus on studying different properties of dynamic networks, e.g. the evolution of subgroups(Falkowski, Bartelheimer and Spiliopoulou 2006), effects of network topology and organizational structure over time (Kossinets and Watts 2006), detecting and predicting statistically significant changes in a network over time (McCulloh and Carley 2011), and new visualization methods using shortest-path computations (Brandes and Pich 2012).

III. Materials and Methods

Gephi is an interactive visualization and exploration platform for all kinds of networks and complex systems, dynamic and hierarchial graphs. Gephi is a tool for people that have to explore and understand graphs. Like Photoshop but for data, the user interacts with the representation, manipulate the structures, shapes and colors to reveal hidden properties. The goal is to help data analysts to make hypothesis, intuitively discover patterns, isolate structure singularities or faults during data sourcing. It is a complementary tool to traditional statistics.

This is a software for Exploratory Data Analysis. Gephi tool provides an fastest graph visualization engine to speed-up understanding and pattern discovery in large graphs. Gephi is powered by ad-hoc OpenGL engine, it is pushing the envelope on how interactive and efficient network exploration can be.

- Networks up to 50,000 nodes and 1,000,000 edges
- Iterate through visualization using dynamic filtering
- Rich tools for meaningful graph manipulation Gephi is a modular software and can be extended with plugins. Plugins can add new features like layout, filters, metrics, data sources, etc. or modify existing features. Gephi is written in Java so anything that can be used in Java can be packaged as a Gephi plug-in.

a) Modularity :

To measure the strength of division of a network into modules (also called groups, clusters or communities). Networks with high modularity have dense connections between the nodes within modules but sparse connections between nodes in different modules.

Modularity algorithm implemented in Gephi looks for the nodes that are more densely connected together than to the rest of the network (it's well explained in the paper they published on the website by the guy who created the algorithm - Google scholar it - Blondel, V. D., Guillaume, J., & Lefebvre, E. (n.d.). Fast unfolding of communities in large networks.)

So then when you implement this measure the colors indicate different communities determined by this algorithm and basically it'll show, in your case, which routers are more densely connected between each other than to the rest of the network.

IV. Implementation and Result

Parameters:

Randomize: On

Use edge weights: On

Resolution: 1.0

Results: Modularity: 0.436

Modularity with resolution: 0.436

Number of Communities: 14

Fig:1 Modularity.

V. Conclusion

Modularity measures how well a network decomposes into modular communities. A high modularity score indicates sophisticated internal structure. This structure, often called a community structure, describes how the network is compartmentalized into sub-networks. These sub-networks (or communities) have been to have significant real-world meaning. The network modularity score is 0.436 and there are 14 distinct communities in a network with 100 nodes. A community can be easily grouped into a set of nodes with dense connections between them. The modularity invokes community-detection algorithm. One of the most widely used methods for community detection is modularity maximization. Modularity is a benefit function that measures the quality of a particular division of a network into communities. The modularity maximization method detects communities by searching over possible divisions of a network for one or more that have particularly high modularity.

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