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Formation of Metagraph Using Clustering

[1] Seema Gaur, [2] Praveen Dhyani

[1, 2] Department of computer science BIT , Jaipur, Raj., India

Abstract - A cluster is grouping of similar objects. In clustering we find object that must be sufficiently close (or similar) to one another. In this paper we deal with a new graph structure called metagraph, which show meta-node to meta-node mapping. This paper explains the clustering methods, based on metagraph clustering. The metagraph clustering method based on the concept that intra-cluster and inter-cluster similarity. We use concept of clustering to construct a metagraph. Clustering metagraph is a natural way for handling different values.

Keywords - *Metagraph, Cluster, Meta-node.*

1. Introduction

Graph is a data structure which represent relations between objects in better way. It is a method that use in many applications like social network analysis ,software visualization and other biological analysis . In these applications objects are visualized as nodes and relations as edges of the graph.

Metagraph Representation:

A metagraph, which is able to represents multi-relational and multi dimensional data. Using metagraph to represent multi-relational activity on a social network . For example using an enterprise considering set of users working in an enterprise . The users in an enterprise link through various running projects, for example A users u1 work for a project p1, and user u2 work on two different projects, p1 and p2 at the same time. Users can interact with each other via email and other network . A metagraph that represents the enterprise graph in which node represent set of elements . Using metagraph that represents combination of relationship and users connected to any number of vertices. So a metagraph is a set to set mapping. Its shows a multiple set of relation on large networks. So a metagraph define as " A metagraph S = {X, E} is a graphical representation consisting of two tuples X and E. Here X is a set of nodes and E is the set of edges defined on generating sets. The set of elements X = {x1, x2, x3,…,xn} represents variables and occurs in the edges of the metagraph.

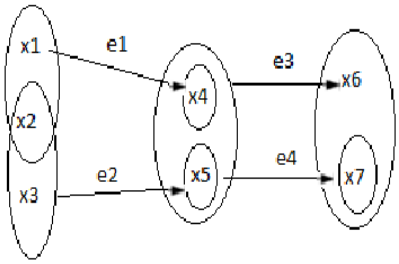

Fig 1. Example of Metagraph

Metagraph is graphical hierarchical structure in which every node is a set having one or more elements. It has all the properties of graphs. In a metagraph, there is set to set mapping in place of node to node as in a conventional graph structure . A social graph is a form of metagraph [2][4]. The social metagraph is constructed using graph clustering algorithms. The social network clustering have vital scope in many research fields[1]. In the resent research areas we find on-line communities.

Various algorithms are already given to discuss online communities. They are base on the assumption that a community are formed by group of actors or members who interact with each other and they are close to each other[7]. Thus, communities form a subnetwork of densely connected members or actors and they are loosely connected to the other members of the remaining network[6]. So we can say that communities of a network are able to find dense subgroups in social graphs. These community form a metanode in a metagraph .

We construct Social metagraph by considering Degree ,Betweenness Centrality and Closeness Centrality. Centrality Degree is the number of direct connections a node has. Betweenness Centrality is considering as node with high betweenness has great influence over what flows in the network indicating important links and single point of failure.

Closeness Centrality is consider as the degree an

individual is near all other individuals in a network (directly or indirectly). It reflects the ability to access information through the network the basics steps are

Rawdata→ pre processing → Prepare Graph→ Add it to Network Various s/w tools for the analysis and/or visualization of social networks have been developed such as UCINET ,StOCNET etc. They deal with static networks but are less effective to deal with social networks. UCINET calculate the centralization's degree in a n/w as a binary network as

degree of centralization = $\Sigma(c_{max} - c(n_i))/ c_{max}$

where c_{max} is the maximum value possible and $c(n_i)$ is the degree centrality of node n_i.

Thus, a metagraph is constructed via an interaction between entities like nodes .The global clustering coefficient is the number of closed triplets (or 3 x triangles) over the total number of triplets (both open and closed). In a metagraph merge of point rather than individual points, the inter distance and intra distance is calculated. Such derived proximity measure is called a linkage metric. The type of the linkage metric used significantly affects hierarchical algorithms, since it reflects the particular concept of closeness and connectivity. Major inter-cluster linkage metrics include single link, average link, and complete link.

closeness centrality

$$C_C(n_i) = \left[\sum_{j=1}^{g} d(n_i, n_j)\right]^{-1}$$

Closeness in terms of distance can be calculated when a graph is connected graph . However, UCINET will compute separate “in” and “out” closeness scores for a non symmetric matrix.

Betweenness Centrality

$$C_B(n_i) = \sum_{j<k} \frac{g_{jk}(n_i)}{g_{jk}}$$

The betweenness centrality scores by dividing them by the maximum possible betweenness, expressed as proportion or percentage.

Metagraph clustering :

A basic clustering algorithm includes the following steps:

1) Extracting feature of the given data.
2Finding the Proximity between the objects; It may be distance measure for numerical data values .
3) Formation of coherent/clustered Groups.
4) Find the purity of the coherent groups/clusters.
5) Presenting the clusters as output.

In general graph based clustering ,a graph can be directed or as a indirected. A social network graph is transfer to metagraph by using clustering . If a social graph contain a loop or cycle then we merge the vertices of the social graph to form a meta-node that is called the vertex of the metagraph. The nodes that share the same resources are create a metanode A cluster graph itself contain metanode or formed a metagraph. . The formation of metagraph is based on finding metanodes .So formation and analyzing the metagraph based on detecting meta nodes in a social network or wide domains as biology and social science and the word wide Web .A well-known graph-theoretic algorithm is based on the Minimal Spanning Tree — MST [3]. A minimum spanning tree for metagraph the edges of the metagraph connect the instances represented as metanodes. Inconsistent metanodes are the nodes whose weight is significantly larger than the average of nearby node. The weight is measure in terms of distance between them.

A Single-link clusters are subgraphs of the MST of the data instances which construct metanode . Every metanode is a subgraph of connected component which have maximum intracluster similarity and minimum inter cluster similarity. A metanode is constructed with instances and each instance is connected to at least one other member of the set, So these metanode are formed on the bases of similarity threshold. In other words a metanode is constructed by set of objects such that the distance between any two objects in a metanode is less than the distance between any object in object not located inside it Clustering is a process of partitioning a set of data (or objects) into a set of meaningful sub-classes, called clusters[8]. Metagraph formation is almost interchangeably term with graph clustering . In both problems, the main object is to find groups of vertices on a graph that are better connected to each other than to the rest of the graph. However, they are differ the way of formation . Metagraph formation methods typically do not require the number of metanodes to be provided as input but graph clustering techniques that require the number of clusters to be provided as input.

sim(mn1, mn2) = 1 if mn1=mn2
0 otherwise mn1!= mn2

Metagraph is use for social network representation and

clustering is useful for finding similar network interest. Metagraph is a graph-based hierarchical data structure in which every node is a set having one or more elements. Metagraphs under such situations can provide a useful and comprehensive function for modeling by extending the features offered by the traditional graph structures like digraphs and hyper-graphs. Metagraph allows different components of the process to be represented both graphically and analytically. Considering an example which show a metagraph which is constructed in matlab using some function of matlab . Using the same we also construct a metagraph for social data clustering and make a social metagraph.

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First Author
Seema Gaur received the M.Tech degrees in Computer Science Engineering from Birla Institute of Technology Mesra Ranchi in 1999 .Working as Assistant Professor(Computer Science) in BIT jaipur campus .