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SUBJECT: SOCIAL NETWORK ANALYTICS (MCSE618P)

ASSESSMENT-2

(REPORT)

INTRODUCTION

To find cohesive groupings or communities inside a broader network, community discovery in social networks is an important task in network analysis.

It includes identifying subgroups of nodes with dense connections within the community and sparse connections with nodes outside of it.

By defining communities, we can learn a lot about the way social networks are structured and how they perform.

Social networks are intricate systems made up of individuals or different entities (nodes) and the connections that exist between them (edges).

These ties can take many different forms, including friendships, teams, interactions, or common interests. The network can be divided into cohesive groups using community detection methods.

Nodes within a community are more likely to engage with one another than with nodes outside of their community.

Various methods and strategies are used by community detection algorithms to find communities in social networks. These algorithms can be broadly divided into two categories: hierarchical algorithms and graph partitioning-based algorithms.

METHODOLOGY & RESULT

Implementing Community Detection Algorithms

We have considered the dataset community_nodes.csv which contains source, destination, and respective weight. We will try to analyse and detect the communities.

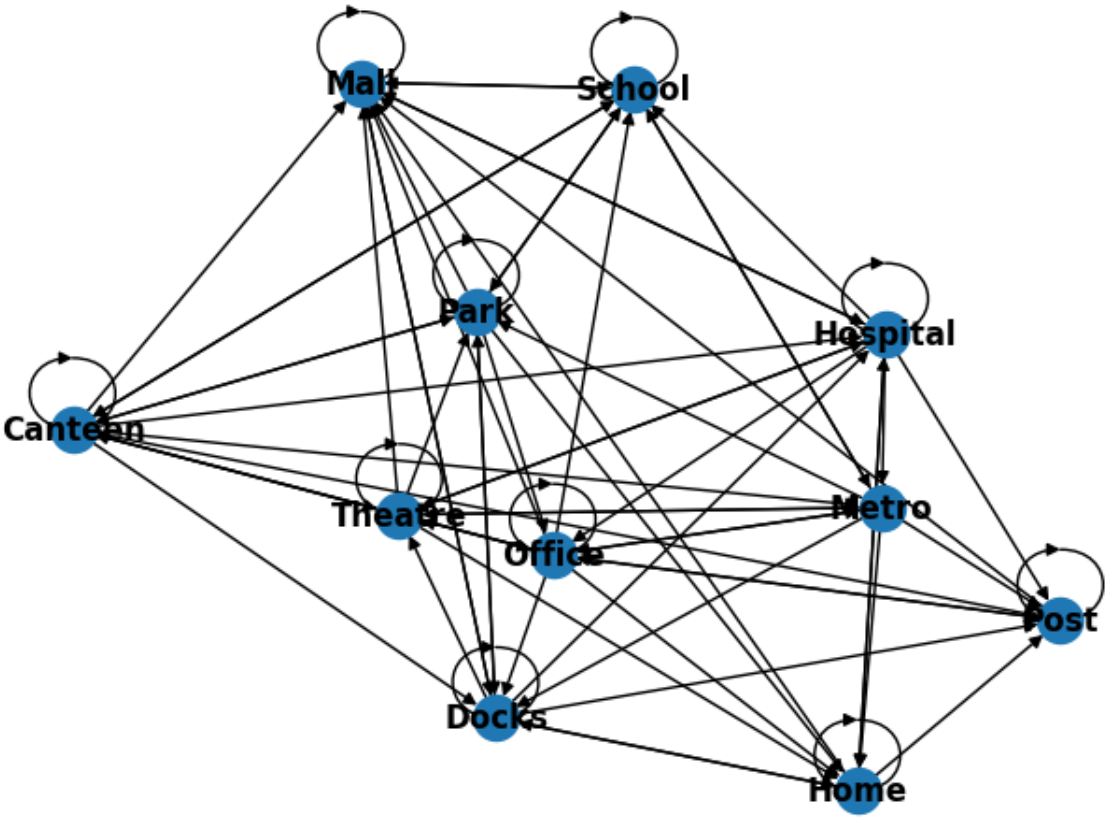
community_nodes.csv ×

1 to 10 of 100 entries Filter

source	destination	weight
School	Metro	19.377219210582798
Canteen	Park	28.056281610318408
Metro	Home	37.609488456312825
Hospital	Theatre	25.813350344890782
Mall	School	48.760440979701535
Office	Metro	13.010113994013187
Docks	Hospital	24.95867508084572
Docks	Home	13.143731195184882
Mall	Mall	21.448719874909695
Canteen	Mall	21.678724914027242

```
Number of nodes: 11
Number of edges: 71
```

Plotting the Directed Graph:

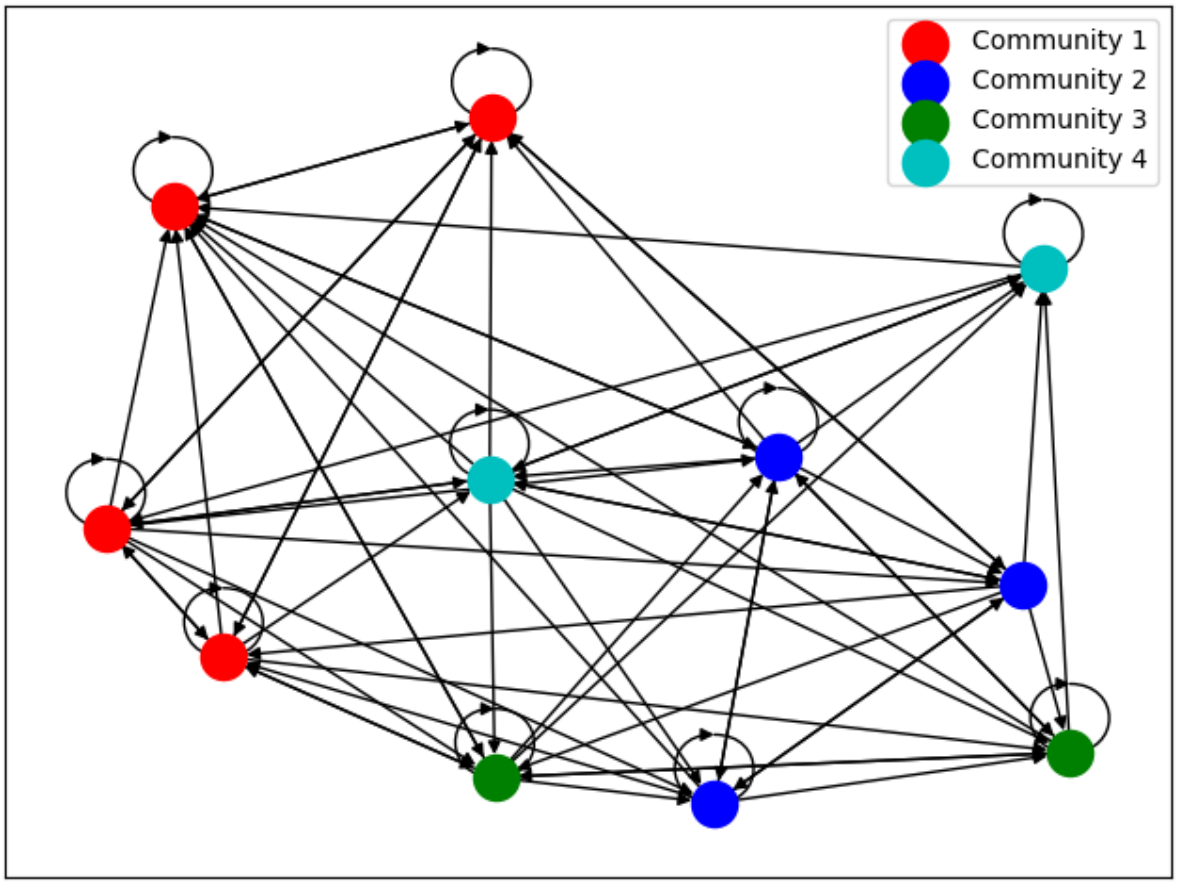


Greedy Modularity Maximization:

We have used this function called Greedy Modularity Maximization to find the community partition with the largest modularity.

Greedy modularity maximization begins with each node in its own community and repeatedly joins the pair of communities that lead to the largest modularity until no further increase in modularity is possible.

```
Community 1: ['Mall', 'Park', 'Canteen', 'School']
Community 2: ['Hospital', 'Metro', 'Theatre']
Community 3: ['Home', 'Docks']
Community 4: ['Post', 'Office']
```



From the following dataset we have identified that there are 4 set of communities that are present and are depicted graphically.

Louvain Algorithm:

The Louvain algorithm optimizes the modularity measure, which quantifies the strength of division of a network into communities.

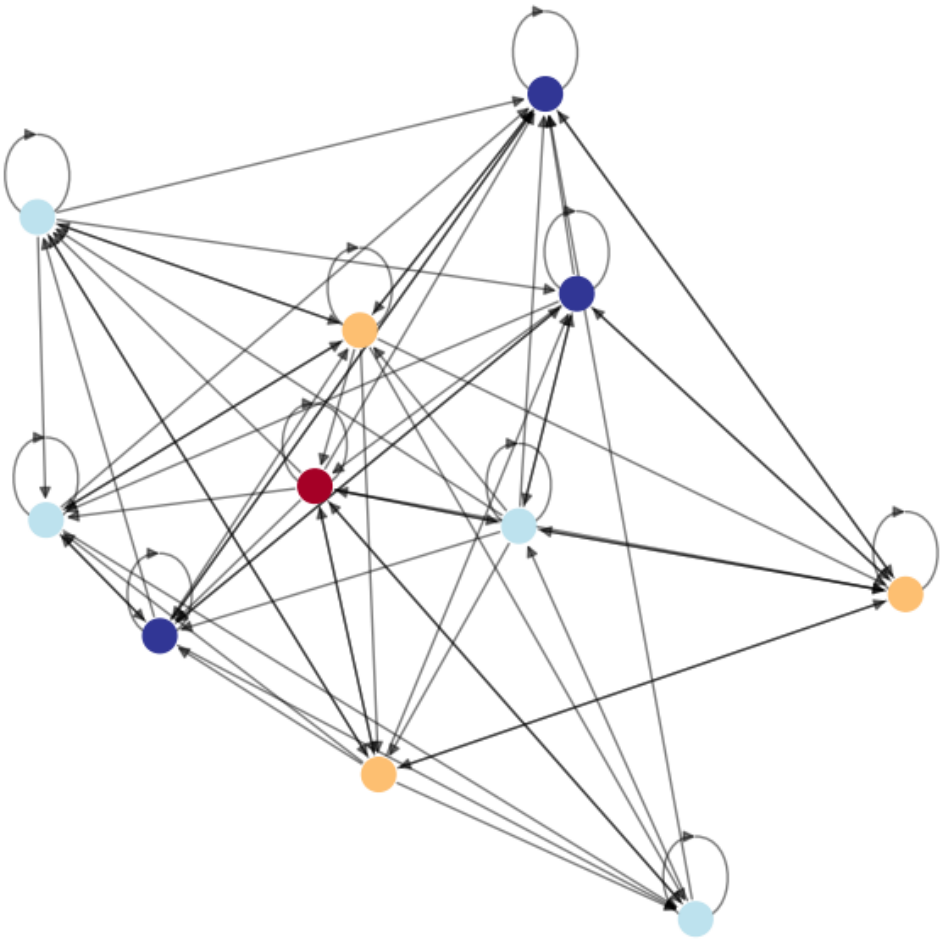
Modularity ranges between (-1,1) where values closer to 1 indicate a strong community structure.

Initial Community Assignment -> Iterative Phase -> Aggregation Phase

Repeat Steps 2 and 3

Output: Final communities obtained represent the detected communities in the social network.

Overall, the Louvain algorithm is a powerful and widely used community detection method in social network analysis due to its efficiency, scalability, and ability to reveal community structures at different levels of granularity.



CONCLUSION

In conclusion, community identifying in social networks is a crucial process that is helpful in revealing the fundamental organisation and structure of intricate social systems.

It gives us significant insights into social dynamics and facilitates a wide range of applications across disciplines by enabling us to comprehend the relationships and interactions among individuals or entities inside a network.

By employing sophisticated algorithms and evaluation metrics, researchers and practitioners can gain a deeper understanding of community structures and their implications in social network analysis.

Source code link: https://github.com/SushRed10/22MCB0005/