

## ACM-ASC Internship 2024

### Solution Approach, Research Contribution and Block Diagram

**Title:** Homophily-driven community detection on attributed networks

**Group No:** ALG06

**Team Lead:** Karthika Sreenivasan (AM.EN.U4CSE22237)

**Faculty Mentor:** Deepthi L R

#### Team Members:

ASWINI AYAPPAN	AM.EN.U4AIE22109
KARTHIKA SREENIVASAN	AM.EN.U4CSE22237
SHERIN SHIBU	AM.EN.U4CSE22355

#### Solution Approach

##### 1) Research problem, Hypothesis and Problem definition

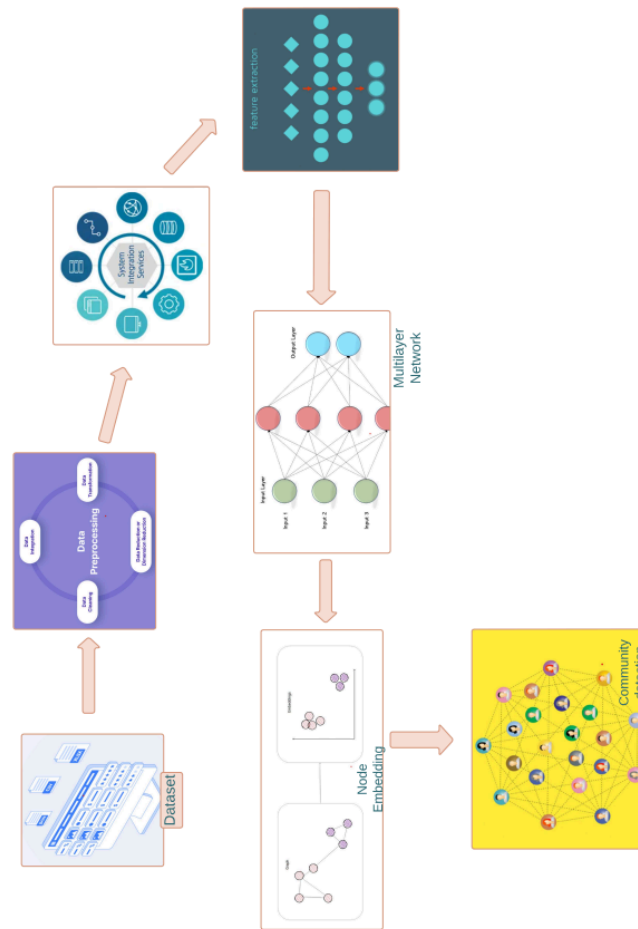
**Research problem:** In social, finding groups of people with similar interests or connections is important. This process is called "community detection." Traditional methods usually look at who is connected to whom, but they often ignore other information like people's attributes. This means that these methods might not fully capture the different ways people can be linked.

**Hypothesis:** Homophily, the tendency of similar nodes to be grouped together plays a crucial role in community detection. This is particularly useful in attributed networks where nodes contain attributes that include personal interest, demographics, and behavior. T The main idea of this paper is that by considering not only the direct connections between people but also their attributes and different types of connections, you can do a better job of finding communities in a network. The hypothesis is that using more information, including people's characteristics, will give a clearer picture of how communities are formed.

**Problem definition:** The problem the paper addresses is that current community detection methods are too simple; they don't take into account the complexity of real networks, which have multiple types of links and different attributes. This leads to less accurate results when identifying groups or communities.

## 2) Solution Approach:

### a. Block Diagram



### b. Provide a brief explanation of your proposed solution approach

To analyze complex networks with different types of connections and attributes, this solution builds a network with multiple layers. These layers can represent different relationships or types of information. The method considers both connections within each layer and those between layers to get a fuller picture of the network.

A Graph Attention Network (GAT) is used to process these connections, focusing on the most important parts of the network. The information from the GAT is then sent to the Louvain algorithm, which is good at finding groups or communities in networks.

This solution is different from traditional methods because it looks at both the structure of the network and the attributes of its nodes, like people's age, location, or interests. By considering these attributes, the approach provides a more complete and accurate way to find communities in complex networks.

### **3) Research Contributions:**

1. The paper proposes an approach for analyzing heterogeneous network, which incorporates multiple types of edges, links, and attributes
2. The methodology involves constructing the multilayer network to represent the heterogeneous network.
3. Intralayer and interlayer connections are considered to indicate the relationships with and between the layers.
4. The intralayer and interlayer connections are fed to a Graph Attention Network
5. The state-of-the-art methods have employed GAT for community detection, but less focus was given to the importance of attributes.
6. The embeddings obtained from the Graph attention network are given to the Louvain algorithm for detecting community detection.