Vidyavardhini's College of Engineering & Technology

Department of Artificial Intelligence and Data Science

AY: 2025-26

Class:		**Semester:**	
Course Code:		**Course Name:**	

Name of Student:	BARI ANKIT VINOD
Roll No. :	61
Experiment No.:	**8**
Title of the Experiment:	**To perform Social Network Analysis (SNA) using R, implementing a Community Detection**
Date of Performance:	
Date of Submission:	

Evaluation

Performance Indicator	Max. Marks	Marks Obtained
Performance	5	
Understanding	5	
Journal work and timely submission	10	
Total	20	

Performance Indicator	Exceed Expectations (EE)	Meet Expectations (ME)	Below Expectations(BE)
Performance	4-5	2-3	1
Understanding	4-5	2-3	1
Journal work and timely submission	8-10	5-8	1-4

Checked by

Name of Faculty :

Signature :

Date :

Experiment No.: 8
AIM:

To perform Social Network Analysis (SNA) using R, implementing a Community Detection Algorithm on a sample dataset.

THEORY:

Social Network Analysis (SNA) is a technique used to study the relationships and interactions between entities (individuals, organizations, or systems).
It represents entities as nodes and their relationships as edges in a network graph.

Community Detection is one of the most important tasks in SNA.
It helps identify groups of nodes that are more densely connected internally than with the rest of the network — often referred to as clusters or communities.

Common algorithms for community detection include:

Louvain Algorithm – modularity-based optimization for detecting large community structures.

Girvan-Newman Algorithm – edge-betweenness-based approach that progressively removes edges.

Label Propagation Algorithm (LPA) – uses iterative label sharing to group nodes efficiently.

These algorithms are used in social media analytics, recommendation systems, and influencer identification.

STEPS TO EXECUTE:

Install R and Required Packages:

```
install.packages("igraph")
install.packages("tidyverse")
```

Load Libraries:

```
library(igraph)
library(tidyverse)
```

Create a Sample Social Network:

```
edges <- data.frame(
  from = c("A", "A", "B", "B", "C", "D", "E", "F", "G", "H"),
  to   = c("B", "C", "D", "E", "F", "G", "H", "A", "C", "E")
)
```

```
g <- graph_from_data_frame(edges, directed = FALSE)
plot(g, vertex.color="skyblue", vertex.size=30, edge.color="gray")
```

Apply Community Detection (Louvain Method):

```
community <- cluster_louvain(g)
plot(community, g, vertex.size=30, vertex.color="lightgreen")
```

Display Results:

```
membership(community)
modularity(community)
```

Interpretation:

The membership() function shows which nodes belong to which community.

The modularity() value indicates how well the network is divided into communities (higher = better).

OBSERVATION:

The network is divided into multiple clusters showing strong internal connectivity within each group. This demonstrates how social networks naturally form communities based on interaction strength.

CONCLUSION:

The Community Detection Algorithm was successfully implemented in R using the igraph package.
It effectively identified clusters in a sample social network, proving useful for real-world applications such as social media analysis, recommendation systems, and identifying influential groups within a network.