\

Experiment No.9
Social Network Analysis using R (for example: Community Detection Algorithm)
Date of Performance:
Date of Submission:

Aim: Social Network Analysis using R (for example: Community Detection Algorithm)

Theory:

Online social platforms have enabled people around the world to interact with each other and build relationships with others they share common interests with. This can be observed in real life — naturally, we tend to develop and maintain relationships with others that are similar to us. People with similar interests tend to gravitate towards each other and become associated in communities — clusters or groups of people that share similar traits with each other. Since people tend to cluster with others similar to them, we can use community detection to identify users with a high number of degrees (connections) and see how far their reach can travel in the network.

User Data Extraction — Since we are only interested in user data, we will only extract the following variables:

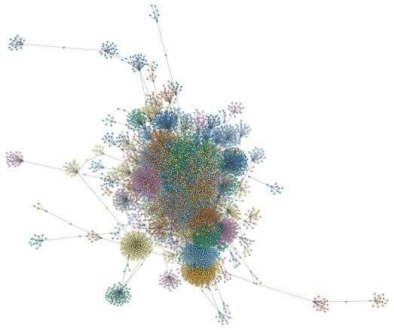
User_id — Yelp user ID; this is needed to make nodes and edges Name — user's first name
Review count — the number of reviews user has written Yelping since — date user joined Yelp
Friends — a list containing all of the user's friends by user_id Fans — number of fans user has
Elite — number of years the user has Elite status
Average stars — user's average rating of all reviews written

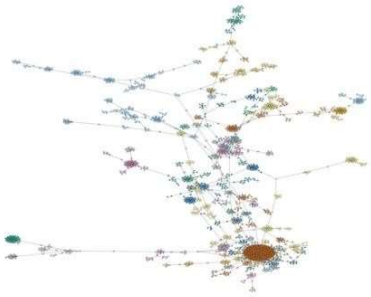
Program:

```
#remove users with no friends

sample <- subset(user_df, friends != "None")

#make a subset; we only need to retain data of users with some social activity sub <-
subset(sample, year == 2005 & review_count >= 2 & no_of_friends >= 2) #make links (nodes
and edges)
sample_friends <- sub %>% select(user_id, friends) sample_users <-
strsplit(sample_friends$friends, split = ",")
sample_dat <- data.frame(user_id = rep(sample_friends$user_id,
  sapply(sample_users, length)), friends = unlist(sample_users))
#network is still too big, take a random sample of 100k nodes samp_net <-
sample_n(sample_dat, 100000)

#make network
```

```
network <- graph.data.frame(samp_net) network_s <- simplify(network) net_deg <- degree(network_s)
all_degree <- degree(network, mode = 'all') #graph user with max degrees
sub_all <- subcomponent(network_s, which(all_degree == max(all_degree)), 'all') g_sub <- induced_subgraph(network_s, sub_all)
#communities

graph.com <- fastgreedy.community(as.undirected(g_sub))

V(g_sub)$color <- graph.com$membership + 1 #create pdf graph for high resolution (try zooming in!) pdf("communities2005.pdf", 10,10)
plot(g_sub,

vertex.color = V(g_sub)$color, vertex.size = 1,
vertex.label = NA,

vertex.frame.color = adjustcolor("#41424c", alpha.f = 0.25), edge.arrow.size = 0.1,
edge.color = adjustcolor("#41424c", alpha.f = 0.20), edge.width = 1.5,
edge.arrow.mode=0, layout=layout_with_lgl, asp = 0.9,
dpi=300

)

dev.off()
```

Output:





Conclusion:

Comment on Social Network Analysis.

Social Network Analysis (SNA) is the study of social structures through the use of networks and graph theory, focusing on relationships and interactions between individuals, groups, or organizations. In SNA, nodes represent entities like people or organizations, and edges represent connections or interactions between them. By analyzing these structures, SNA helps identify key influencers, communities, or patterns of information flow within networks. It has applications in areas like sociology, marketing, epidemiology, and cybersecurity, where understanding the dynamics of relationships can provide insights into behavior, influence, or risk within social systems.