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| 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

CODE:

```
#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,
```

```
length(sample_users)), 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

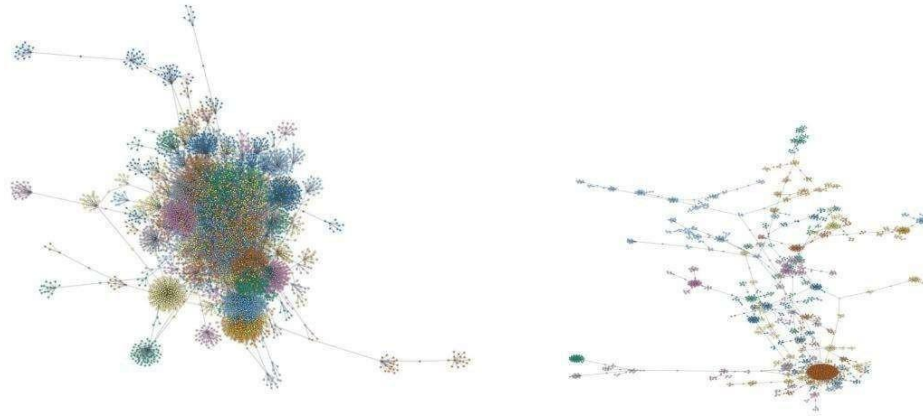
      , asp = 0.9,

      dpi=300
```



)

dev.off()



CONCLUSION:

Social Network Analysis (SNA) is the process of exploring or examining the social structure by using graph theory. It is used for measuring and analyzing the structural properties of the network. It helps to measure relationships and flows between groups, organizations, and other connected entities.