

Twitter network analysis

ANALYZING SOCIAL MEDIA DATA IN R

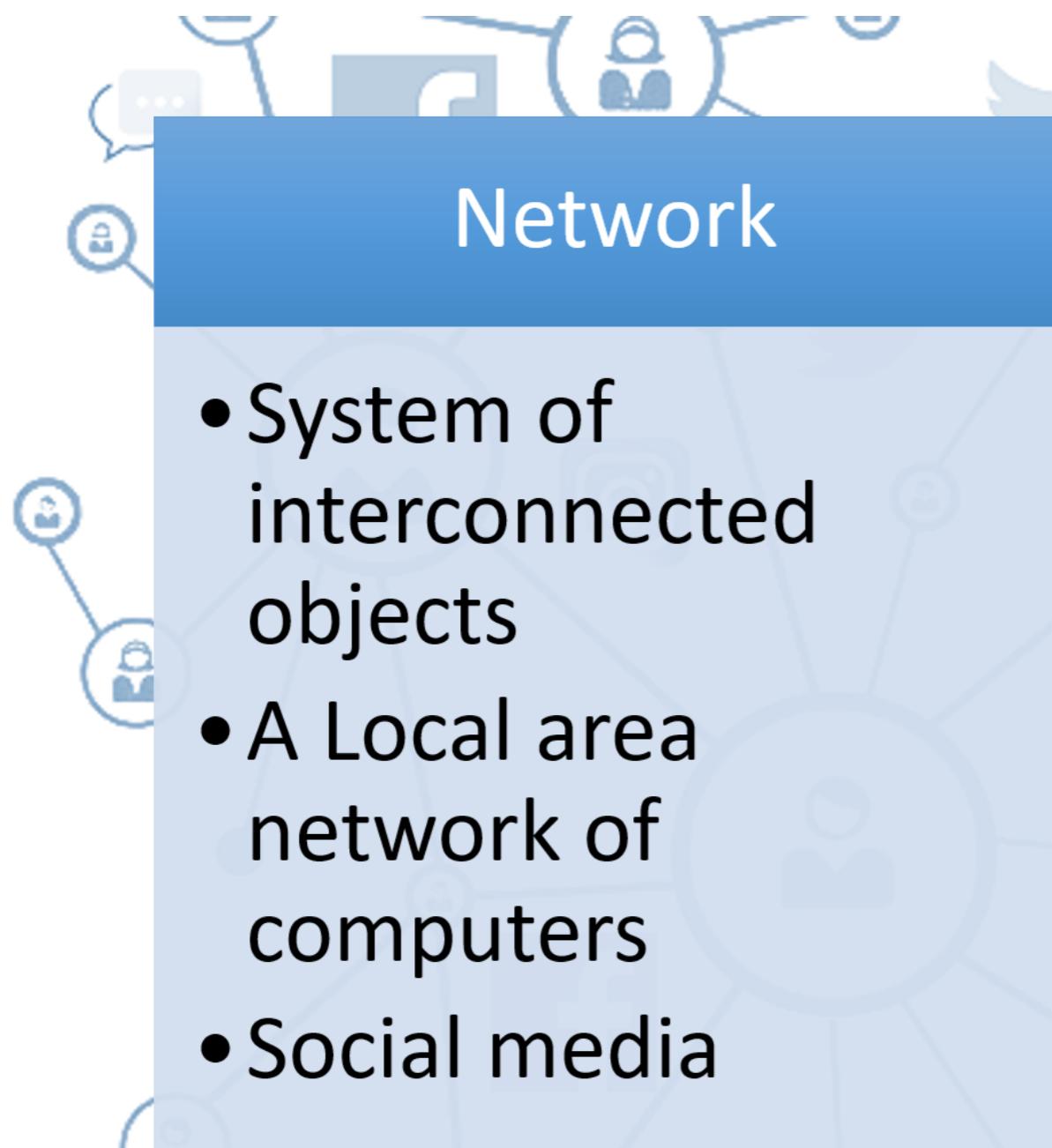


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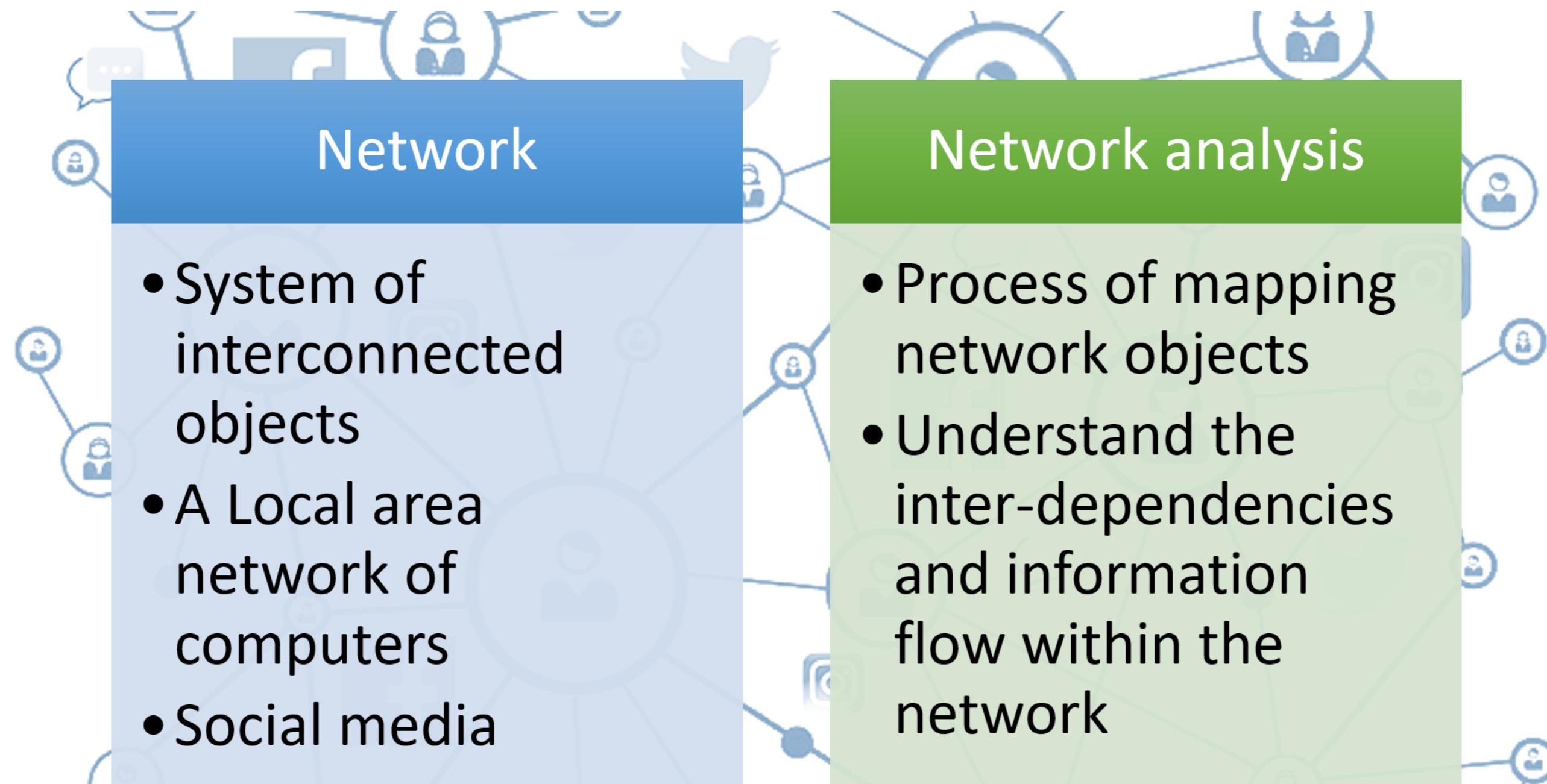
Lesson overview

- Understand the concepts of networks
- Application of network concepts to social media
- Create a retweet network for a topic

Network and network analysis



Network and network analysis



Components of a network

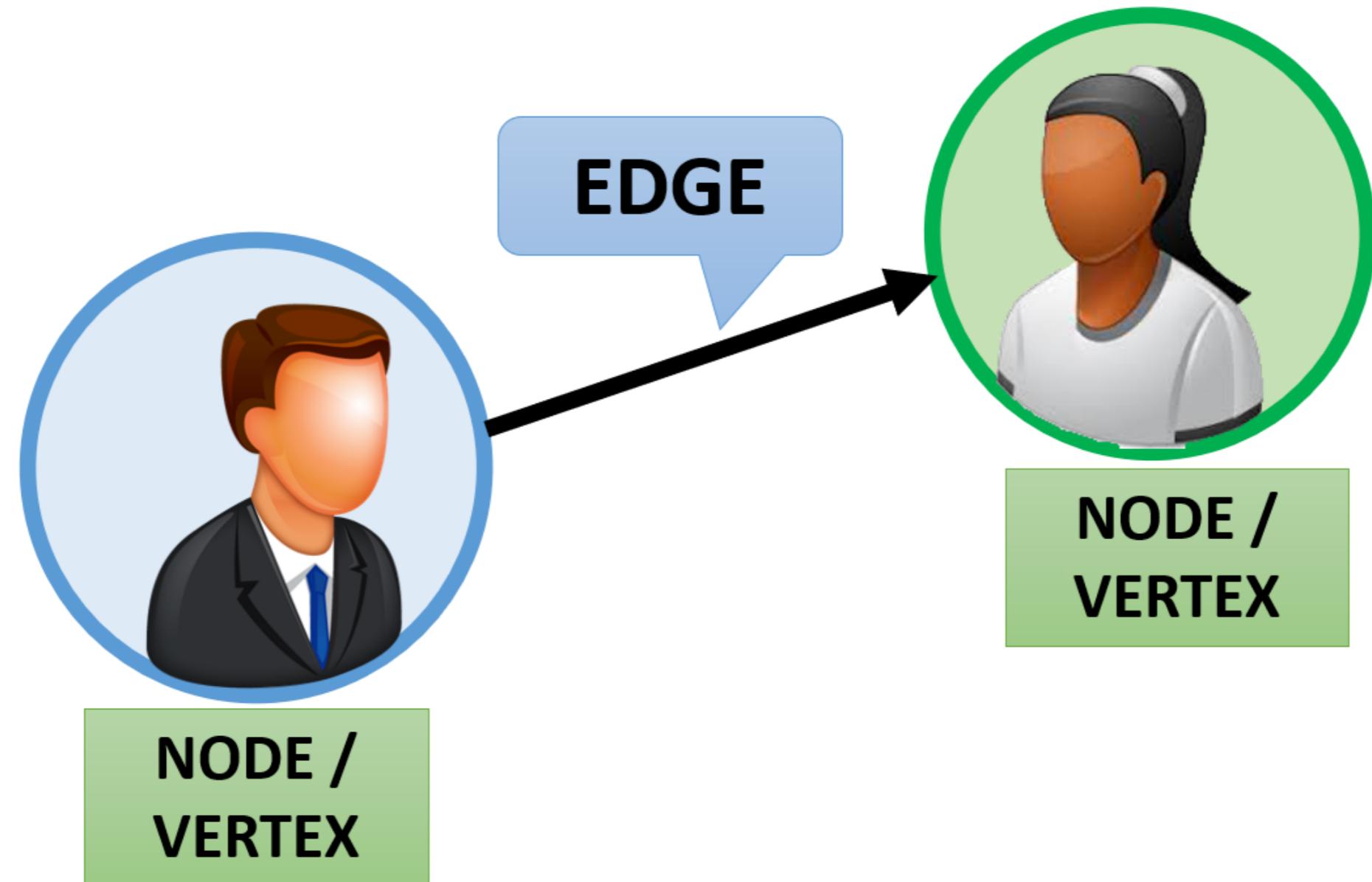


**NODE /
VERTEX**

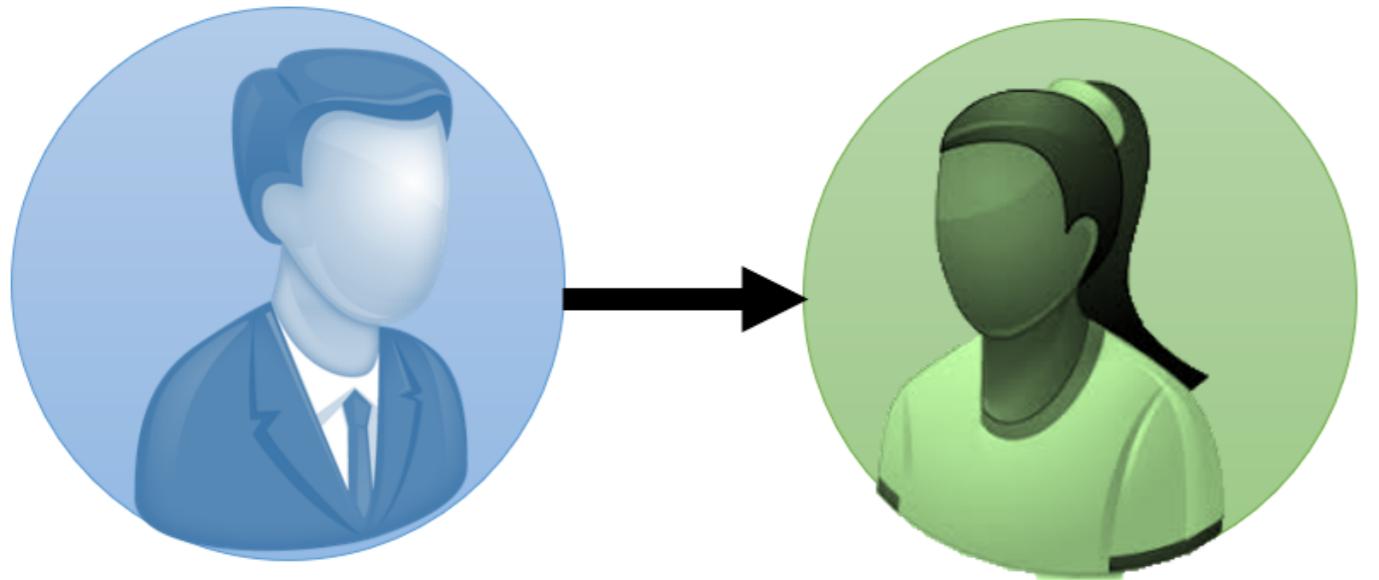


**NODE /
VERTEX**

Components of a network



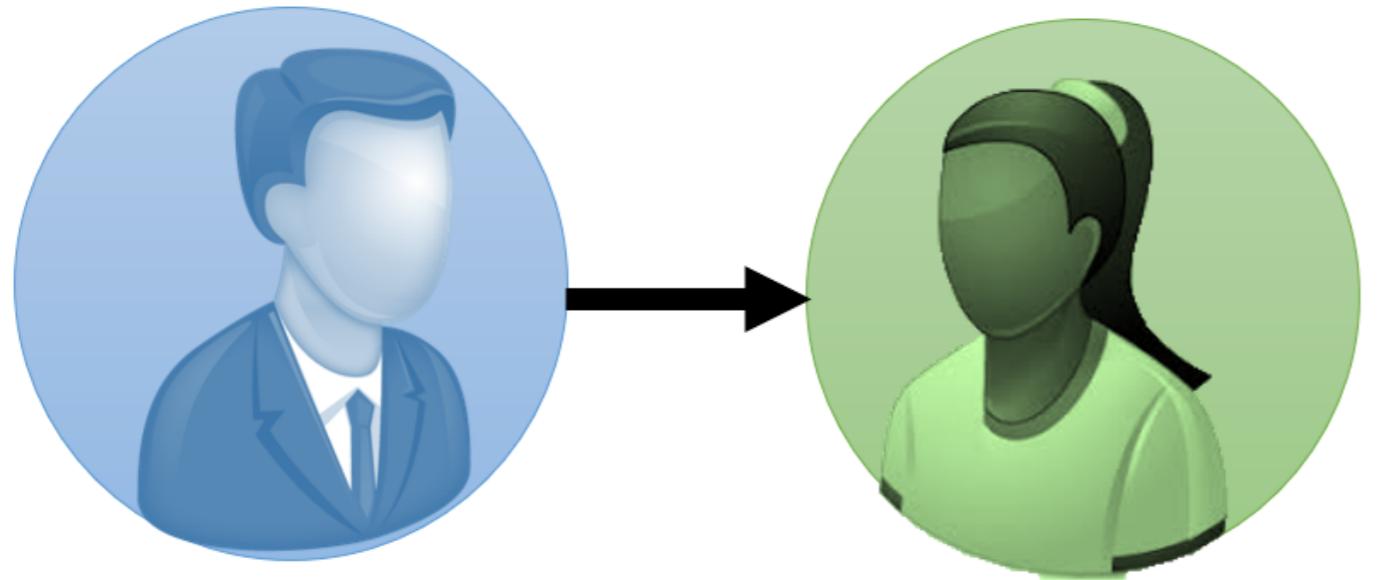
Directed vs undirected network



Directed Network

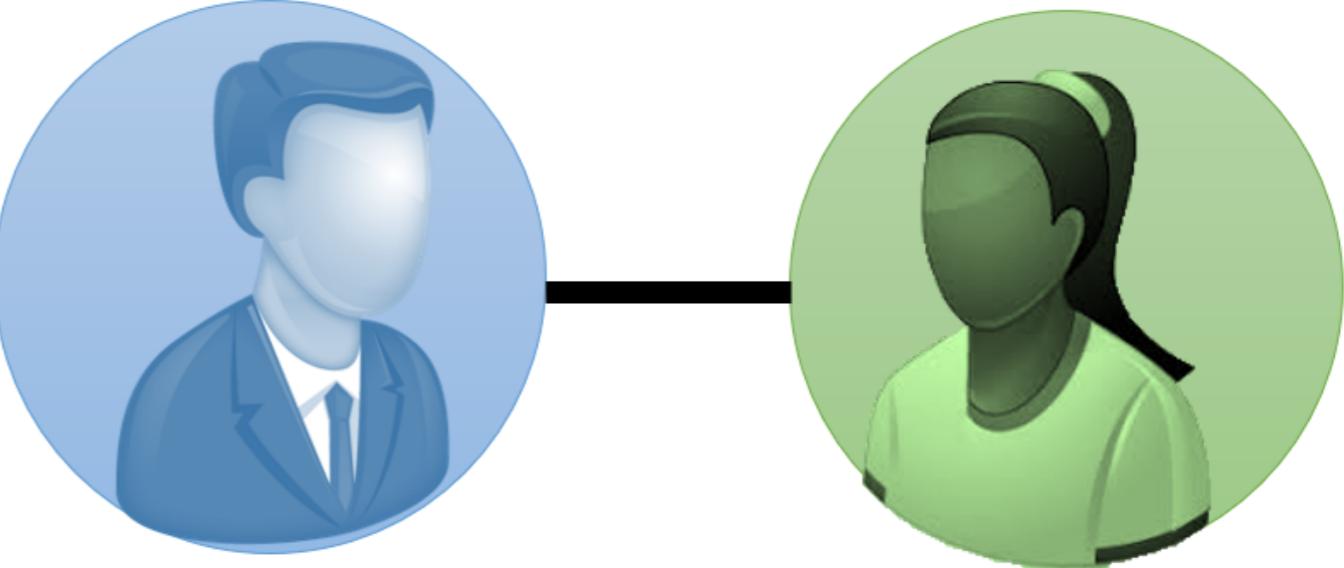
- Edges of network point to one direction

Directed vs undirected network



Directed Network

- Edges of network point to one direction



Undirected Network

- Edges have no direction

Applications in social media

- Twitter users create complex network structures
- Analyze the structure and size of the networks
- Identify key players and influencers in a network
- Pivotal to transmit information to a wide audience

Retweet network

- Network of users who retweet original tweets posted
- A directed network where the source vertex is the user who retweets
- Target vertex is the user who posted the original tweet
- Position on a retweet network helps identify key players to spread brand messaging

Retweet network of #OOTD

- Create a retweet network of users who retweet on #OOTD
- This hashtag is popular amongst users in the age group 16-24
- Can be used to grab the attention of potential customers

Create the tweet data frame

```
# Create tweet data frame for tweets on #OOTD  
twts_OOTD <- search_tweets("#OOTD ", n = 18000, include_rts = TRUE)
```

Create data frame for the network

```
# Create data frame for the network  
rt_df <- twts_00TD[, c("screen_name" , "retweet_screen_name" )]
```

```
head(rt_df, 10)
```

```
screen_name      retweet_screen_name  
<chr>            <chr>  
ShesinfashionCc          NA  
glamwearplanet          NA  
lanacond0r             LiveKellyRyan  
animeninjaz            NA  
zeluslondon             NA  
IonaJaneLevy            NA
```

Include only retweets in the data frame

```
# Remove rows with missing values  
rt_df_new <- rt_df[complete.cases(rt_df), ]
```

Convert data frame to a matrix

```
# Convert to matrix  
matrixx <- as.matrix(rt_df_new)
```

Create the retweet network

```
# Create the retweet network  
library(igraph)  
nw_rtweet <- graph_from_edgelist(el = matrx, directed = TRUE)
```

View the retweet network

```
# View the retweet network  
print.igraph(nw_rtweet)
```

View the retweet network

```
IGRAPH 7f42937 DN-- 4100 4616 --
+ attr: name (v/c)
+ edges from 7f42937 (vertex names):
[1] MaikielYungin ->ZingletC      MaikielYungin ->ZingletC
[3] victoria_shop_1->victoria_shop_1 victoria_shop_1->victoria_shop_1
[5] victoria_shop_1->victoria_shop_1 victoria_shop_1->victoria_shop_1
[7] victoria_shop_1->victoria_shop_1 victoria_shop_1->victoria_shop_1
[9] victoria_shop_1->victoria_shop_1 w3daily          ->RealFirstBuzz
[11] w3daily           ->RealFirstBuzz   w3daily          ->RealFirstBuzz
[13] w3daily           ->RealFirstBuzz   w3daily          ->RealFirstBuzz
[15] w3daily           ->RealFirstBuzz   w3daily          ->RealFirstBuzz
```

Let's practice!

ANALYZING SOCIAL MEDIA DATA IN R

Network centrality measures

ANALYZING SOCIAL MEDIA DATA IN R



Sowmya Vivek
Data Science Coach

Lesson overview

- Concept of network centrality measures
- Degree centrality and betweenness
- Identify key players in the network and their role in a promotional campaign

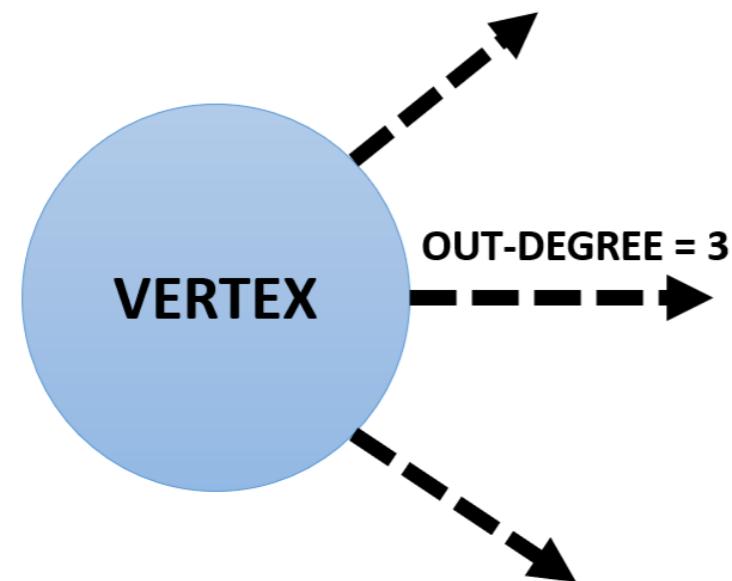
Network centrality measures

- Influence of a vertex is determined by the number of edges and its position
- Network centrality is the measure of importance of a vertex in a network
- Network centrality measures assign a numerical value to each vertex
- Value is a measure of a vertex's influence on other vertices

Degree centrality

- Simplest measure of vertex influence
- Determines the edges or connections of a vertex
- In a directed network, vertices have out-degree and in-degree scores

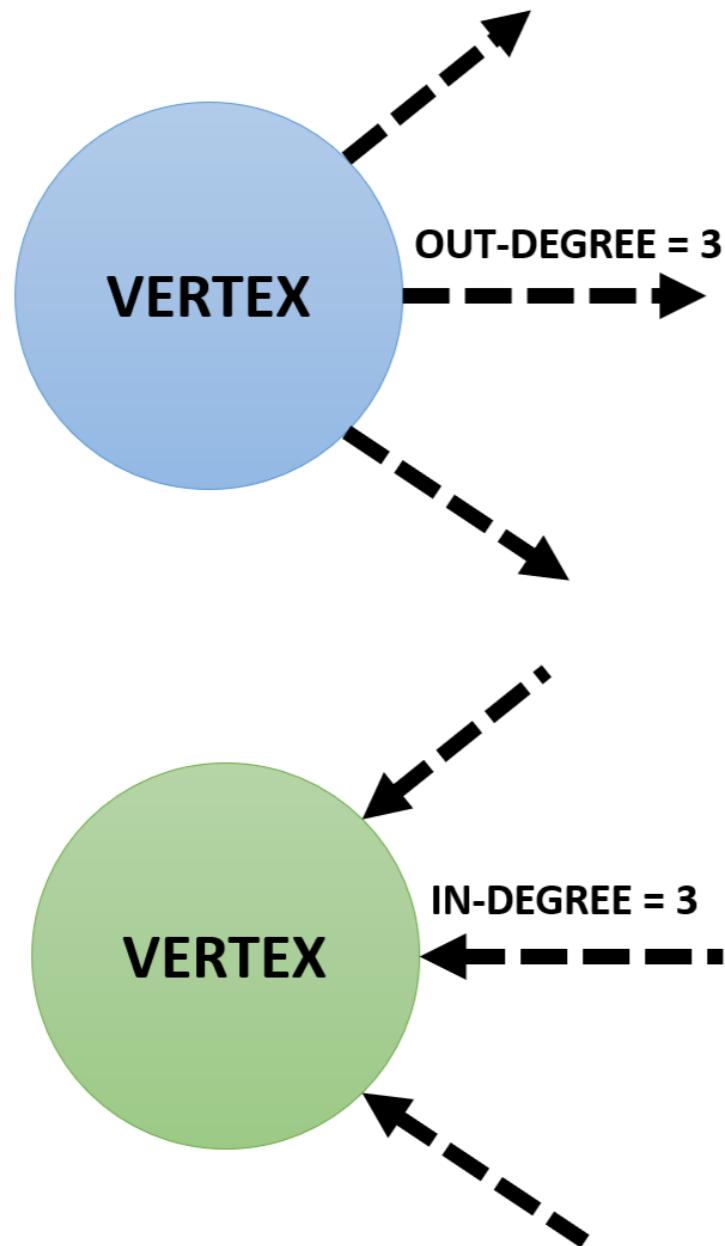
Out-degree



Out-degree

- Number of outgoing edges from a vertex
- Measure of number of times user retweets

In-degree



Out-degree

- Number of outgoing edges from a vertex
- Measure of number of times user retweets

In-degree

- Number of incoming edges to a vertex
- Measure of number of times a user's posts are retweeted

Degree centrality of a user

```
library(igraph)  
# Calculate out-degree  
out_deg <- degree(nw_rtweet,  
                    "OutfitAww",  
                    mode = c("out"))  
  
out_deg
```

OutfitAww
20

```
library(igraph)  
# Calculate in degree  
in_deg <- degree(nw_rtweet,  
                    "OutfitAww",  
                    mode = c("in"))  
  
in_deg
```

OutfitAww
23

Users who retweeted most

```
# Calculate the out-degree scores  
out_degree <- degree(nw_rtweet, mode = c("out"))
```

```
# Sort the users in descending order of out-degree scores  
out_degree_sort <- sort(out_degree, decreasing = TRUE)
```

Users who retweeted most

```
# View the top 3 users  
out_degree_sort[1:3]
```

VanesEtim	RedNileShop	w3daily
209	147	62

Users whose posts were retweeted most

```
# Calculate the in-degree scores  
in_degree <- degree(nw_rtweet, mode = c("in"))
```

```
# Sort the users in descending order of in-degree scores  
in_degree_sort <- sort(in_degree, decreasing = TRUE)
```

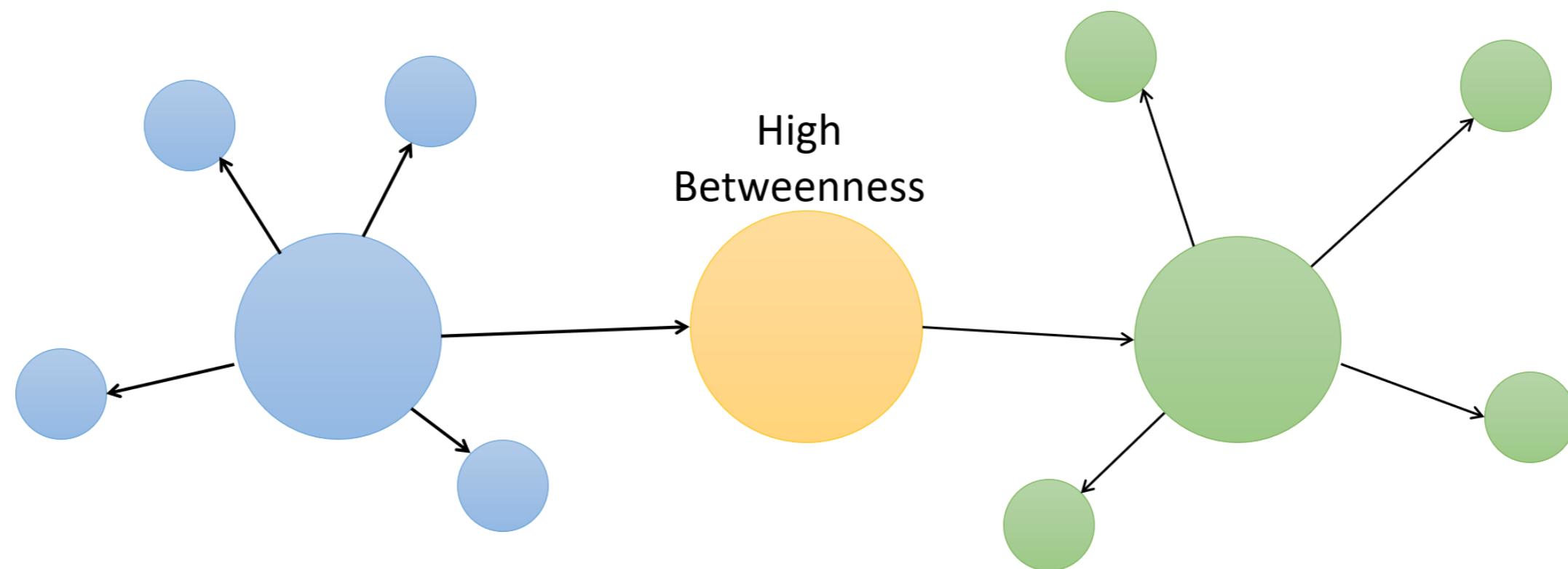
Users whose posts were retweeted most

```
# View the top 3 users  
in_degree_sort[1:3]
```

XyC_129	SocialBflyMag	jisoupy
171	167	142

Betweenness

- Degree to which nodes stand between each other
- Captures user role in allowing information to pass through network
- Node with higher betweenness has more control over the network



Identifying users with high betweenness

```
# Calculate the betweenness scores of the network  
betwn_nw <- betweenness(nw_rtweet, directed = TRUE)
```

```
# Sort the users in descending order of betweenness scores  
betwn_nw_sort <- betwn_nw %>%  
  sort(decreasing = TRUE) %>%  
  round()
```

Identifying users with high betweenness

```
# View the top 3 users  
betwn_nw_sort[1:3]
```

GuruOfficial	Home_and_Loving	SimplyTasheena
65	54	40

Let's practice!

ANALYZING SOCIAL MEDIA DATA IN R

Visualizing twitter networks

ANALYZING SOCIAL MEDIA DATA IN R



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Data Science Coach

Lesson overview

- Plot a network with default parameters
- Apply formatting attributes to improve the readability
- Use network centrality and attributes to enhance the plot

View a retweet network

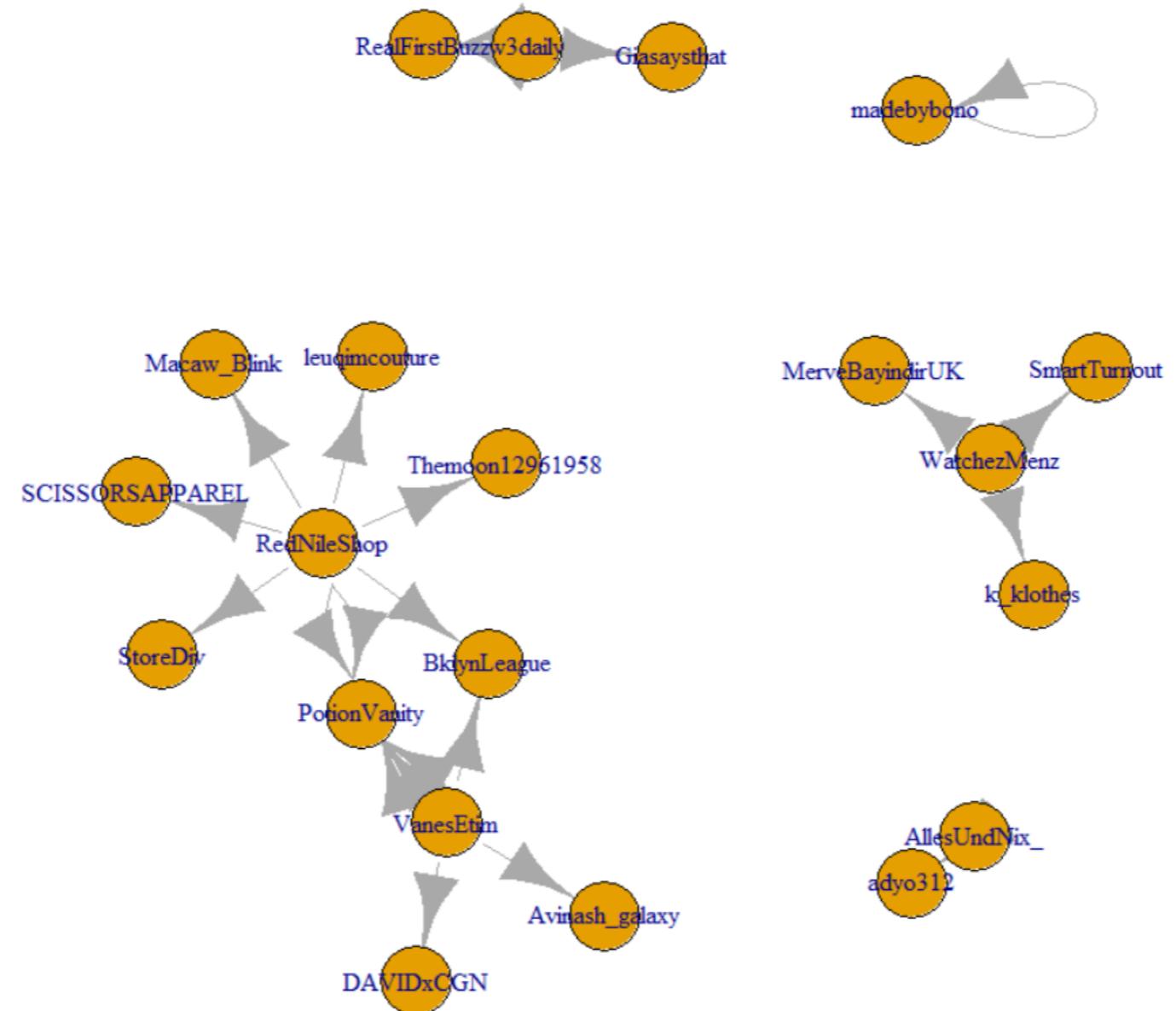
```
# View the retweet network  
print.igraph(nw_rtweet)
```

```
IGRAPH e7e618c DN-- 21 39 --  
+ attr: name (v/c), followers (v/c)  
+ edges from e7e618c (vertex names):  
[1] w3daily      ->RealFirstBuzz    w3daily      ->RealFirstBuzz  
[3] w3daily      ->Giasaysthat     w3daily      ->RealFirstBuzz  
[5] VanesEtim    ->PotionVanity   VanesEtim    ->DAVIDxCGN  
[7] VanesEtim    ->PotionVanity   VanesEtim    ->Avinash_galaxy  
[9] VanesEtim    ->PotionVanity   VanesEtim    ->BklynLeague  
[11] RedNileShop ->Macaw_Blink    RedNileShop ->leuqimcouture
```

Create the base network plot

```
# Create the base network plot  
set.seed(1234)  
plot.igraph(nw_rtweet)
```

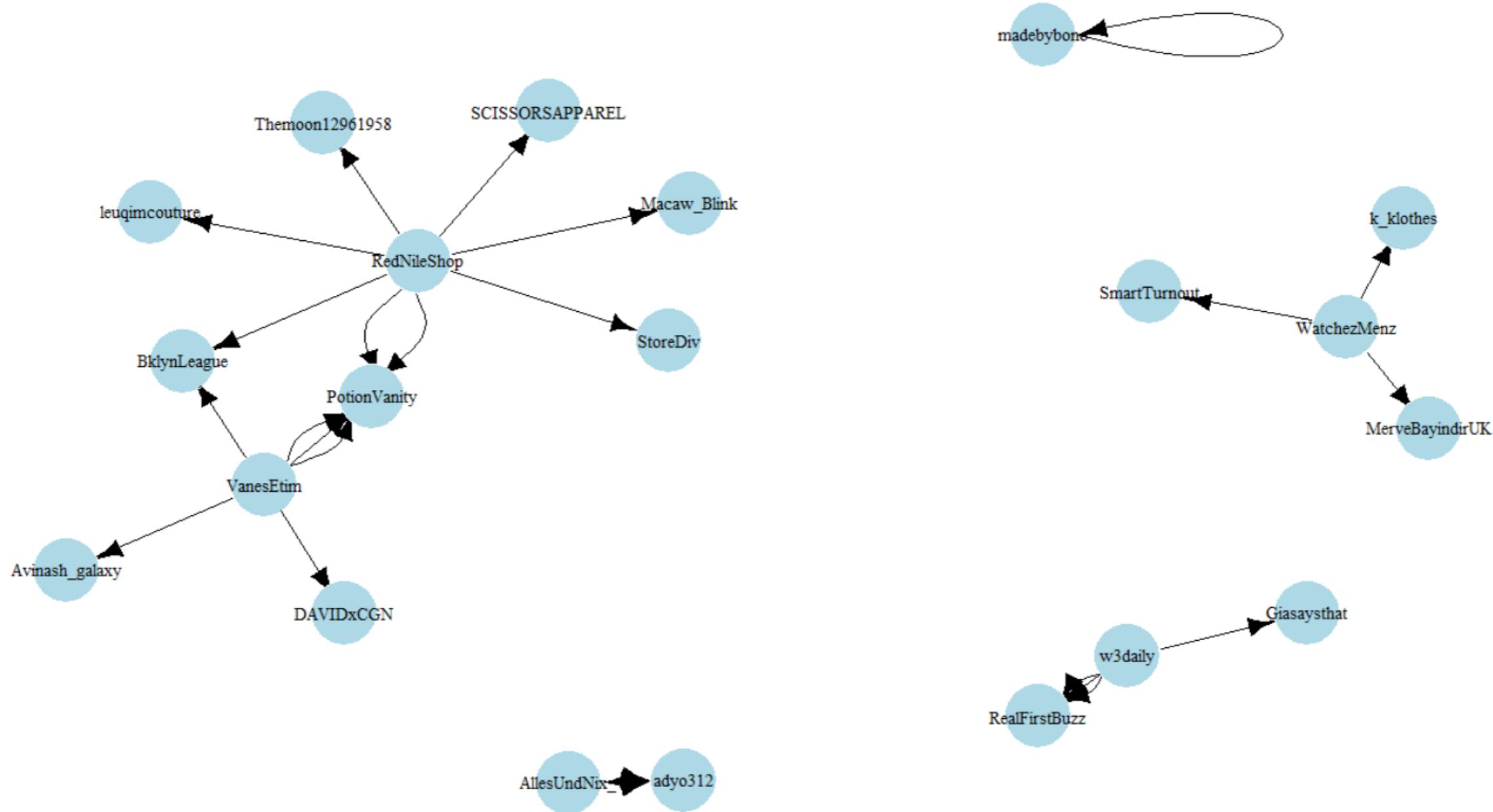
View the base network plot



Format the plot

```
# Format the network plot with attributes  
set.seed(1234)  
plot(nw_rtweet, asp = 9/16,  
     vertex.size = 10,  
     vertex.color = "lightblue",  
     edge.arrow.size = 0.5,  
     edge.color = "black",  
     vertex.label.cex = 0.9,  
     vertex.label.color = "black")
```

View the formatted plot



Set vertex size based on the out-degree

```
# Create a variable for out-degree  
deg_out <- degree(nw_rtweet, mode = c("out"))  
deg_out
```

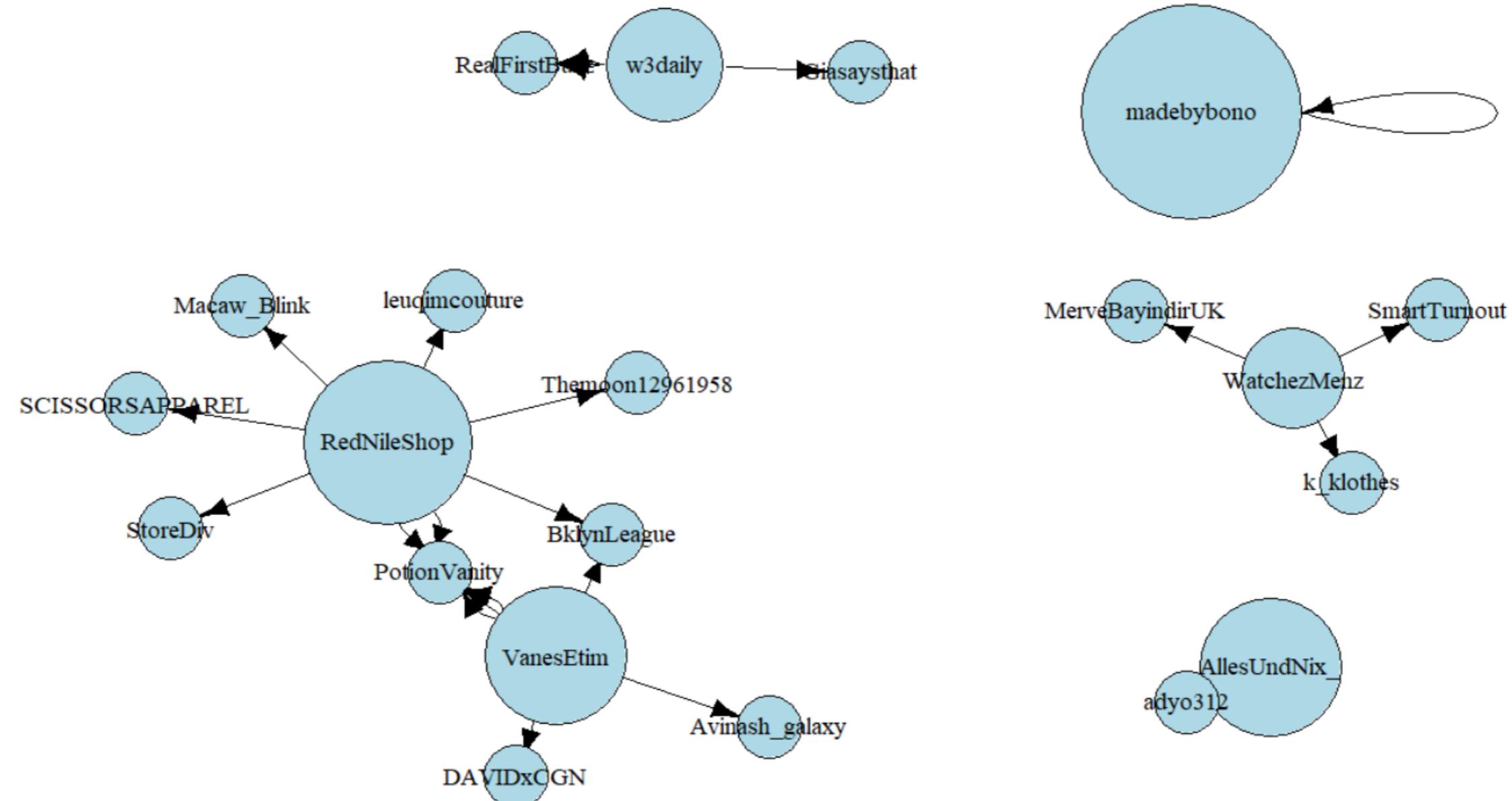
w3daily	RealFirstBuzz	Giasaysthat	VanesEtim	PotionVanity
4	0	0	6	0
DAVIDxCGN	Avinash_galaxy	BklynLeague	RedNileShop	Macaw_Blink
0	0	0	8	0
leuqimcouture	storeDiv	SCISSORSAPPAREL	Themoon12961958	watchezMenz
0	0	0	0	3
MerveBayindirUK	k_klothes	SmartTurnout	AllesUndNix_	adyo312
0	0	0	6	0
madebybono				
12				

```
vert_size <- (deg_out * 2) + 10
```

Assign `vert_size` to the `vertex size` attribute

```
# Assign vert_size to vertex size attribute and plot network  
set.seed(1234)  
plot(nw_rtweet, asp = 9/16,  
     vertex.size = vert_size,  
     vertex.color = "lightblue",  
     edge.arrow.size = 0.5,  
     edge.color = "black",  
     vertex.label.cex = 1.2,  
     vertex.label.color = "black")
```

View plot with new attributes



Adding network attributes

- Users who retweet most and have a high follower count add more value
- Network plot of users who retweet more and have a high follower count
- Add follower count as a network attribute

Follower count of network users

```
# Import the followers count data frame  
followers <- readRDS("follower_count.rds")
```

View the followers data frame

```
# View the follower count  
head(followers)
```

```
screen_name      followers_count  
<fctr>            <dbl>  
adyo312           58  
AllesUndNix_      18  
Avinash_galaxy    1536  
BklynLeague       40  
DAVIDxCGN         267  
Giasaysthat       9139
```

Follower count of network users

```
# Categorize high and low follower count  
followers$follow <- ifelse(followers$followers_count > 500, "1", "0")
```

View the followers data frame

```
# View the data frame with the new column  
head(followers)
```

screen_name	followers_count	follow
<fctr>	<dbl>	<chr>
adyo312	58	0
AllesUndNix_	18	0
Avinash_galaxy	1536	1
BklynLeague	40	0
DAVIDxCGN	267	0
Giasaysthat	9139	1

Assign network attributes

```
# Assign external network attributes to retweet network  
V(nw_rtweet)$followers <- followers$follow
```

View vertex attributes

```
# View the vertex attributes  
vertex_attr(nw_rtweet)
```

\$name

```
[1] "w3daily"          "RealFirstBuzz"    "Giasaysthat"      "VanesEtim"  
[5] "PotionVanity"    "DAVIDxCGN"       "Avinash_galaxy"   "BklynLeague"  
[9] "RedNileShop"       "Macaw_Blink"     "Leuqimcouture"   "StoreDiv"  
[13] "SCISSORSAPPAREL" "Themoon12961958" "watchezMenz"     "MerveBayindirUK"  
[17] "k_klothes"        "SmartTurnout"   "AllesUndNix_"    "adyo312"  
[21] "madebybono"
```

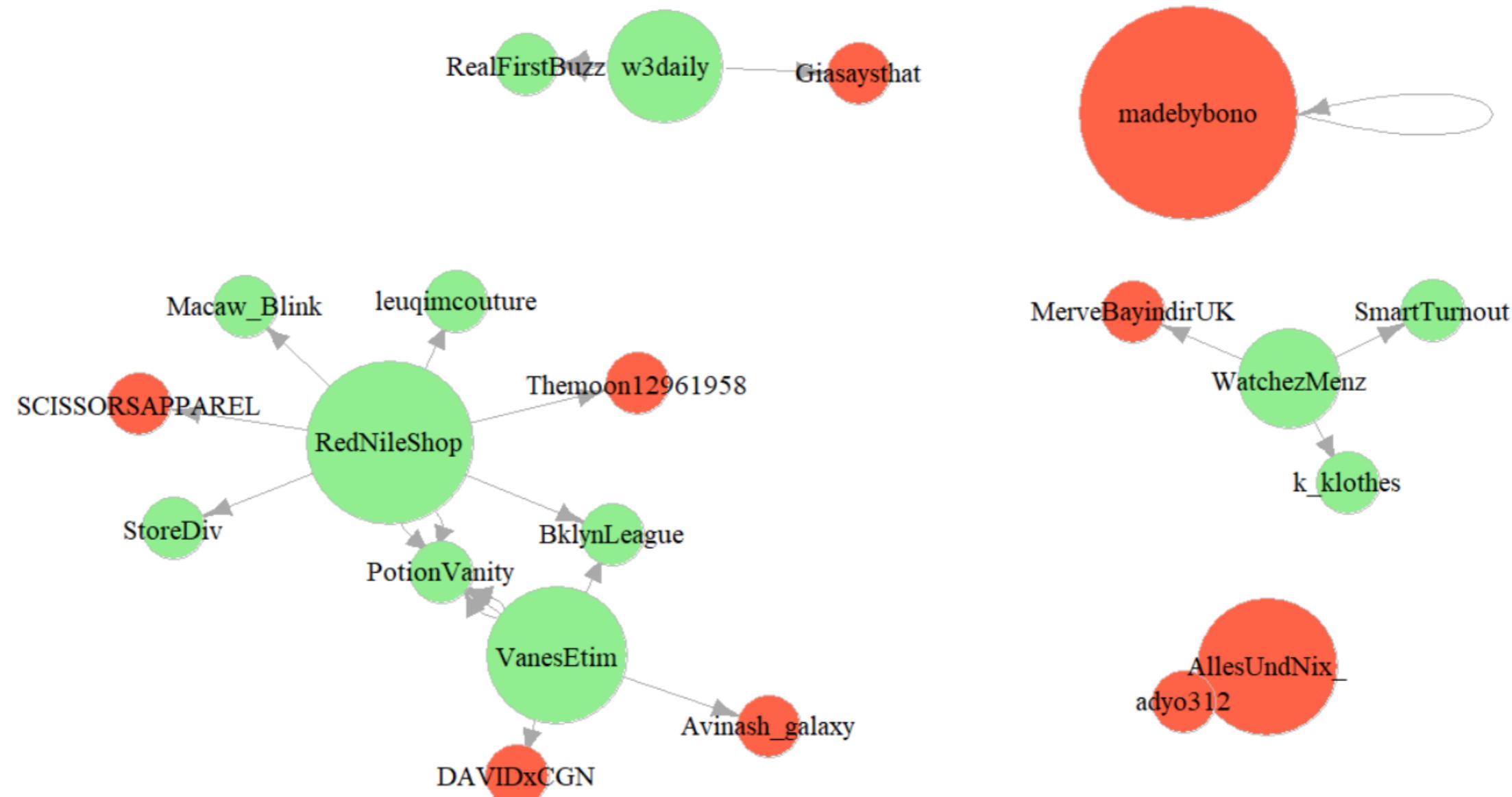
\$followers

```
[1] "0"  "0"  "1"  "0"  "0"  "1"  "1"  "0"  "0"  "0"  "0"  "0"  "1"  "1"  "0"  "1"  "0"  "0"  "1"  
[20] "1"  "1"
```

Changing vertex colors

```
# Set the vertex colors for the plot
sub_color <- c("lightgreen", "tomato")
set.seed(1234)
plot(nw_rtweet, asp = 9/16,
      vertex.size = vert_size,
      edge.arrow.size = 0.5,
      vertex.label.cex = 1.3,
      vertex.color = sub_color[as.factor(vertex_attr(nw_rtweet, "followers"))],
      vertex.label.color = "black",
      vertex.frame.color = "grey")
```

View plot formatted with vertex attributes



Let's practice!

ANALYZING SOCIAL MEDIA DATA IN R

Putting twitter data on the map

ANALYZING SOCIAL MEDIA DATA IN R



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Data Science Coach

Lesson overview

- Types of geolocation data available in tweets
- Sources of geolocation information
- Extract location details from tweets
- Plot the tweet location data on maps

Why put twitter data on the map

- Mapping locations help understand where tweets are concentrated
- Influence people in those locations with targeted marketing
- Understand reactions to planned or unplanned events

Include geographic metadata

- Twitter users can geo-tag a tweet when it is posted
- Two types of geolocation metadata
 - Place
 - Precise location

Place

- "Place" location is selected from a predefined list
- Includes a bounding box with latitude and longitude coordinates
- Not necessarily issued from the location of the tweet



Precise location

- Specific longitude and latitude "Point" coordinate from GPS-enabled devices
- Represents the exact GPS location
- Only 1-2% of tweets are geo-tagged

Sources of geolocation information

- The tweet text
- User account profile
- Twitter Place added by the user
- Precise location point coordinates

Extract tweets

```
library(rtweet)
```

```
# Extract 18000 tweets on "#politics"  
pol <- search_tweets("#politics", n = 18000)
```

Extract geolocation data

```
# Extract geolocation data and append new columns  
pol_coord <- lat_lng(pol)
```

- The coordinates are extracted from the columns, `coords_coords` or `bbox_coords`

View lat and lng columns

```
View(pol_coord)
```

lat	lng
NA	NA
38.79944	-90.32932550
NA	NA
NA	NA
NA	NA

Omit rows with missing lat and lng values

```
# Omit rows with missing lat and lng values  
pol_geo <- na.omit(pol_coord[, c("lat", "lng")])
```

View geocoordinates

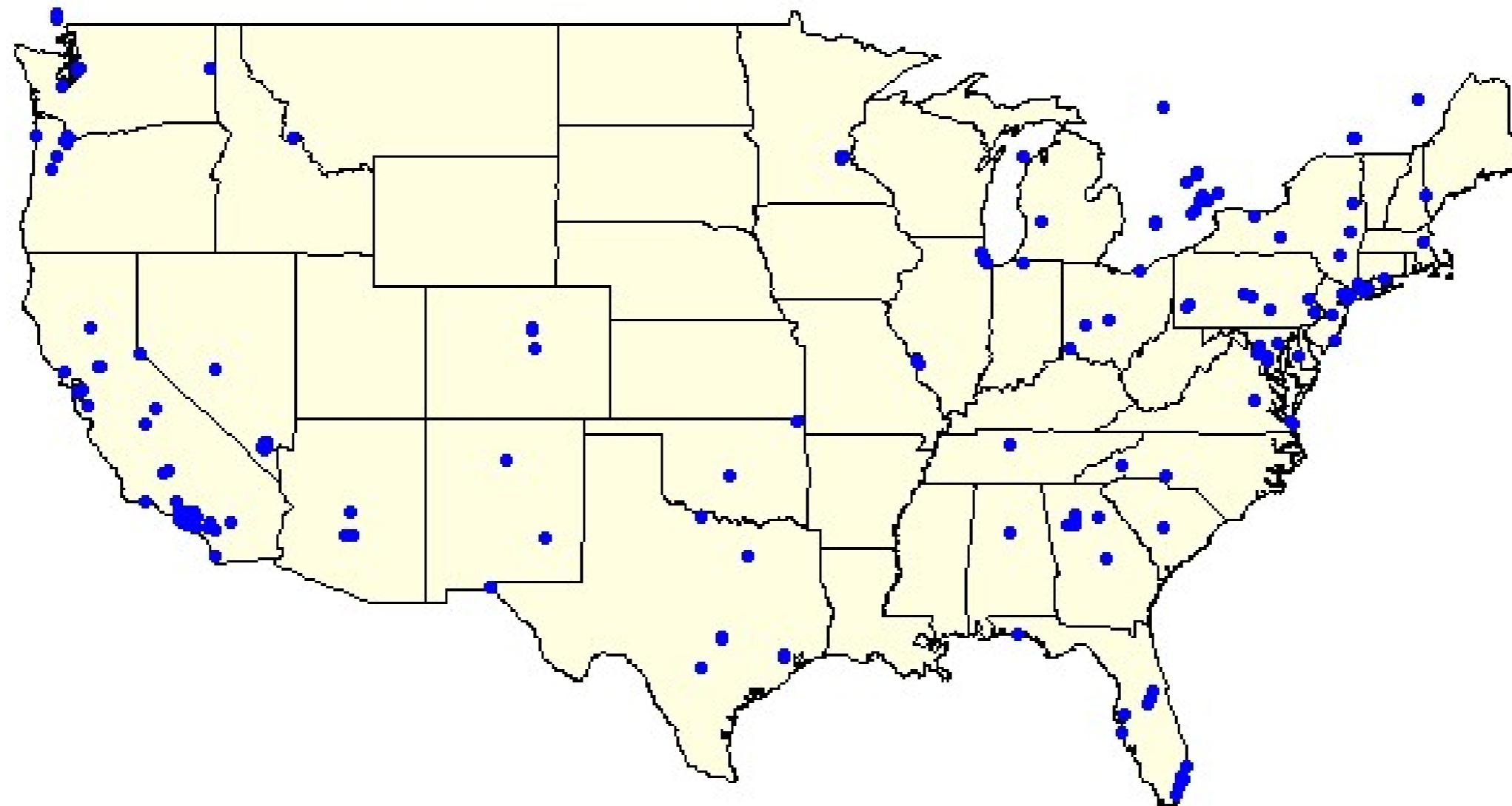
```
head(pol_geo)
```

```
lat          lng
<dbl>        <dbl>
19.17414    72.874244
53.35490    -6.247621
53.27350    -6.399521
53.67989    9.372680
12.92311    77.558448
54.59940    -5.836670
```

Plot geo-coordinates on the US state map

```
# Plot longitude and latitude values of tweets on US state map  
map(database = "state", fill = TRUE, col = "light yellow")  
  
with(pol_geo, points(lng, lat, pch = 20, cex = 1, col = 'blue'))
```

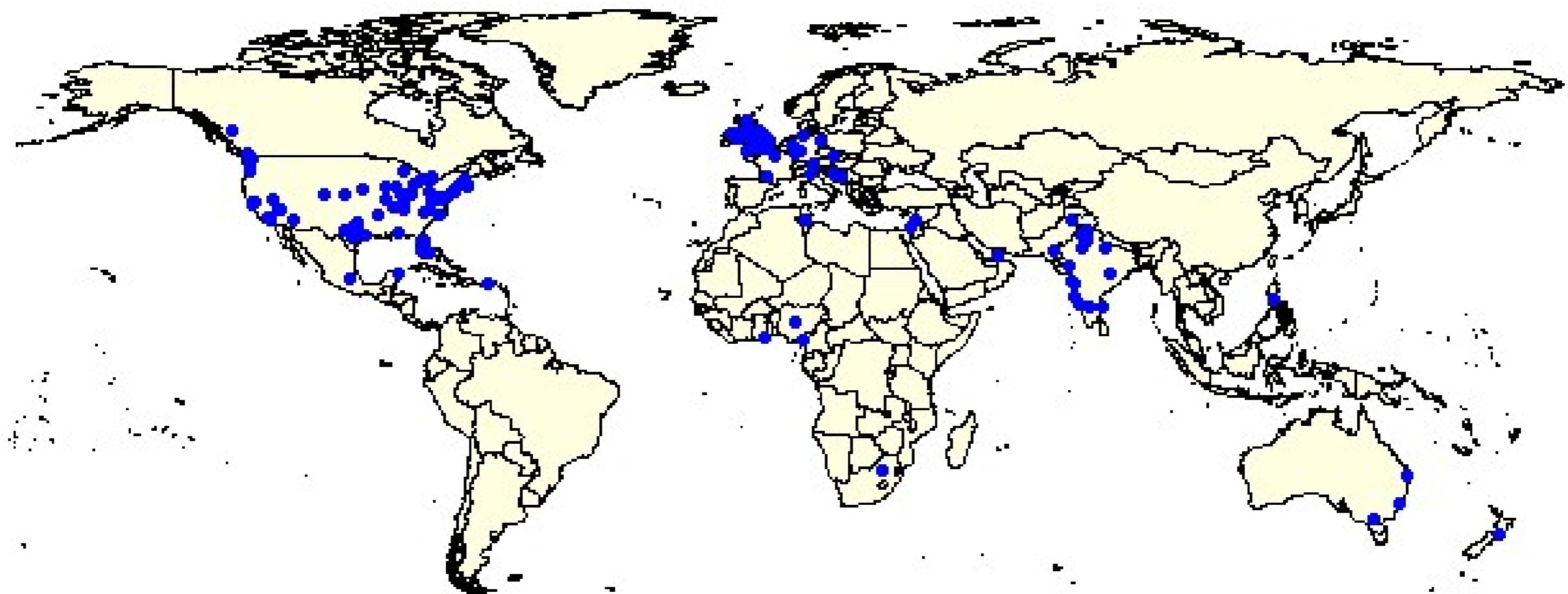
View the locations on the US state map



Plot geocoordinates on the world map

```
# Plot longitude and latitude values of tweets on the world map  
map(database = "world", fill = TRUE, col = "light yellow")  
  
with(pol_geo, points(lng, lat, pch = 20, cex = 1, col = 'blue'))
```

View the locations on the world map



Let's practice!

ANALYZING SOCIAL MEDIA DATA IN R

Course wrap-up

ANALYZING SOCIAL MEDIA DATA IN R



Sowmya Vivek
Data Science Coach

Our learning journey

Chapter 1

- Power of twitter data
- Tweet components

Our learning journey

Chapter 1

- Power of twitter data
- Tweet components

Chapter 2

- Filter tweets
- Golden ratio
- Twitter lists
- Trends
- Plot data over time

Our learning journey

Chapter 1

- Power of twitter data
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Chapter 3

- Process & visualize tweet text
- Topic modeling
- Sentiment analysis

Our learning journey

Chapter 1

- Power of twitter data
- Tweet components

Chapter 2

- Filter tweets
- Golden ratio
- Twitter lists
- Trends
- Plot data over time

Chapter 3

- Process & visualize tweet text
- Topic modeling
- Sentiment analysis

Chapter 4

- Network analysis
- Visualize locations on the map

Next steps

- Reinforce the concepts learned:
 - Collect twitter data around brands, topics, and events
 - Apply the concepts learned
- Enroll for DataCamp courses on important topics in social media analysis
 - Text mining in R
 - Networking analysis in R

Congratulations



Thank you!

ANALYZING SOCIAL MEDIA DATA IN R