



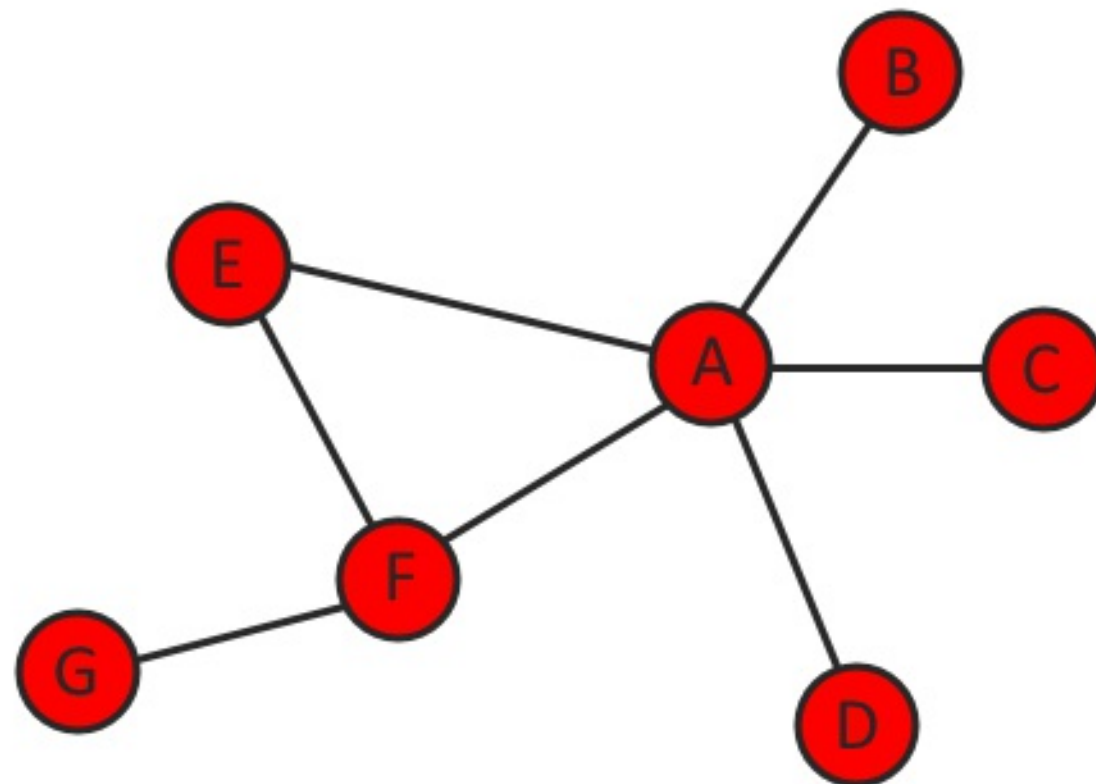
NETWORK ANALYSIS IN R

# What are social networks?

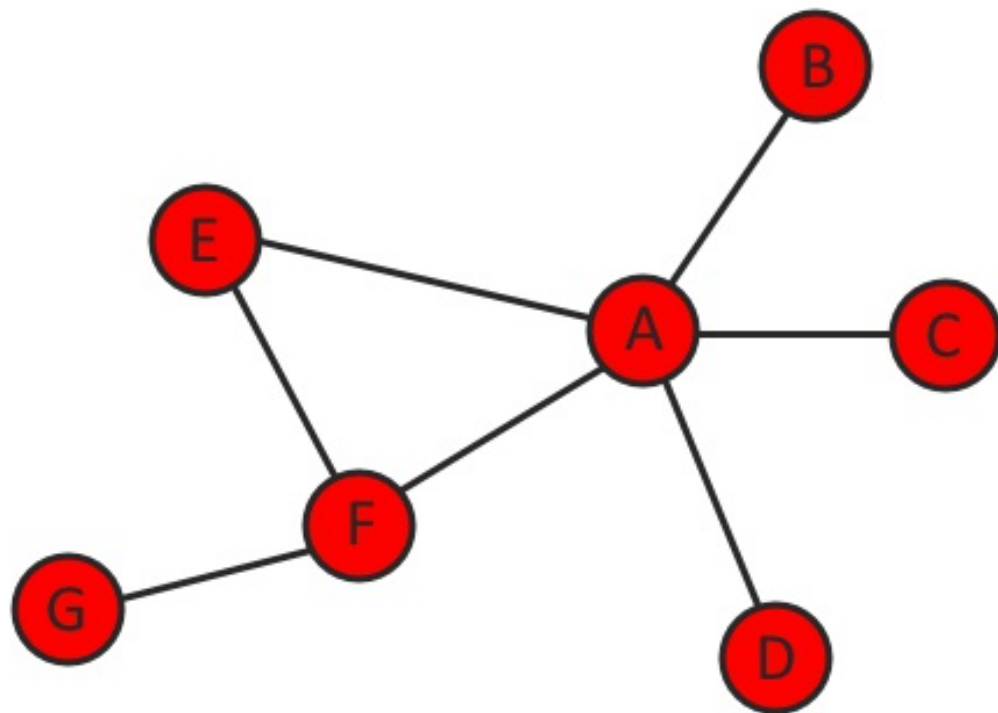
James Curley

Associate Professor,  
University of Texas at Austin

# What are Social Networks?

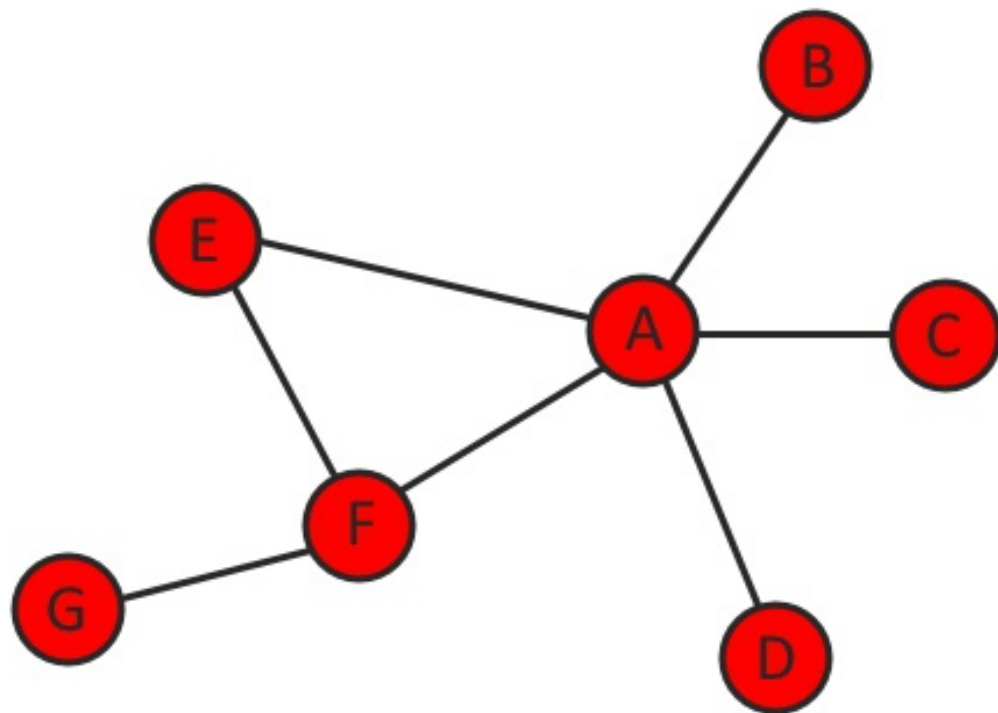


# Network Data: Adjacency Matrix



	A	B	C	D	E	F	G
A	0	1	1	1	1	1	0
B	1	0	0	0	0	0	0
C	1	0	0	0	0	0	0
D	1	0	0	0	0	0	0
E	1	0	0	0	0	1	0
F	1	0	0	0	1	0	1
G	0	0	0	0	0	1	0

# Network Data: Edgelist



A	B
A	C
A	D
A	E
A	F
E	F
F	G



# The igraph R package

A	B
A	C
A	D
A	E
A	F
E	F
F	G

```
library(igraph)

g <- graph.edgelist(as.matrix(df),
                    directed = FALSE)

g

IGRAPH UN-- 7 7 --
+ attr: name (v/c)
+ edges (vertex names):
[1] A--B A--C A--D A--E A--F E--F
```

# igraph objects

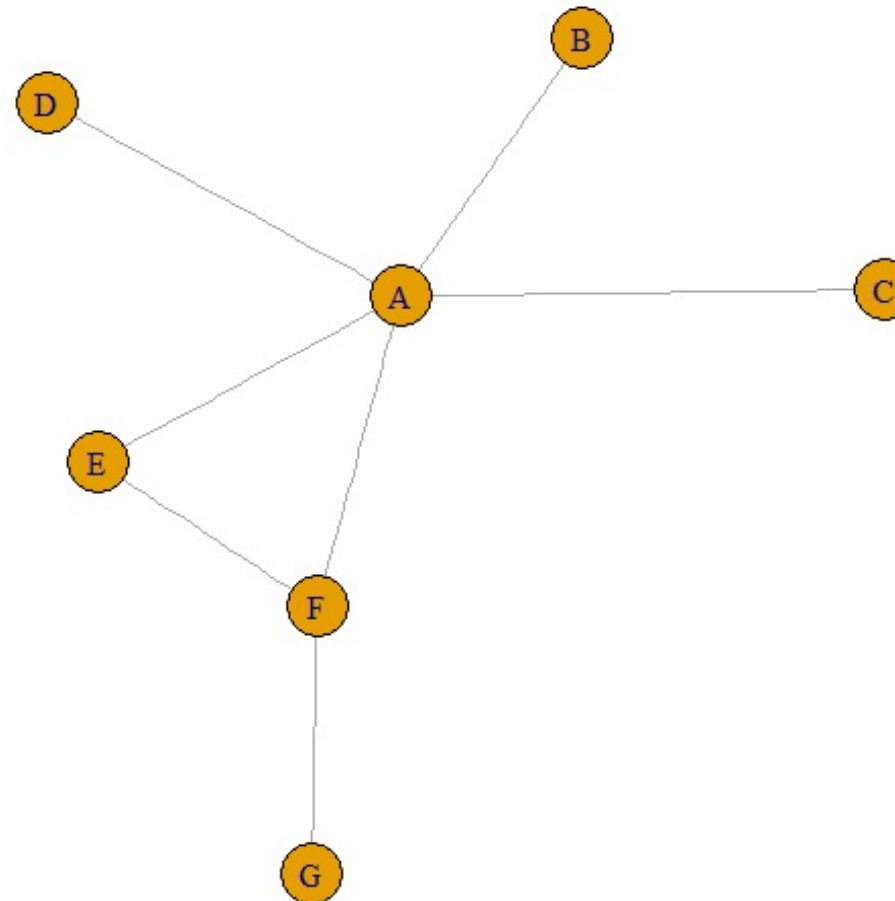
```
V(g)
+ 7/7 vertices, named:
[1] A B C D E F G

E(g)
+ 7/7 edges (vertex names):
[1] A--B A--C A--D A--E A--F E--F

gorder(g)
[1] 7

gsize(g)
[1] 7
```

```
plot(g)
```





## NETWORK ANALYSIS IN R

**Let's practice!**



NETWORK ANALYSIS IN R

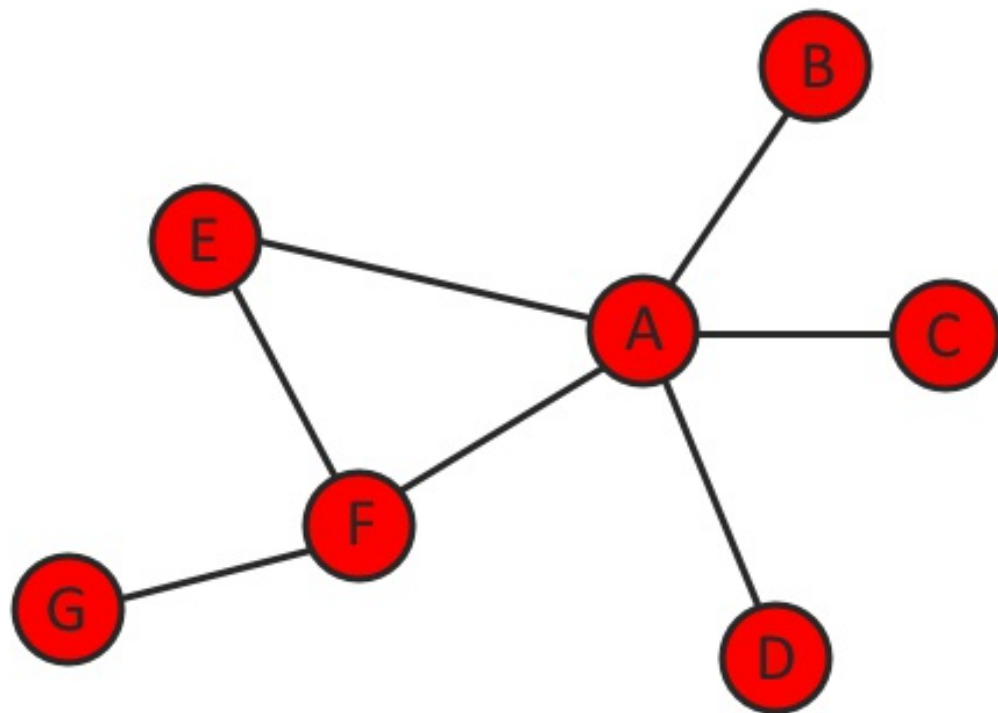
# Network attributes

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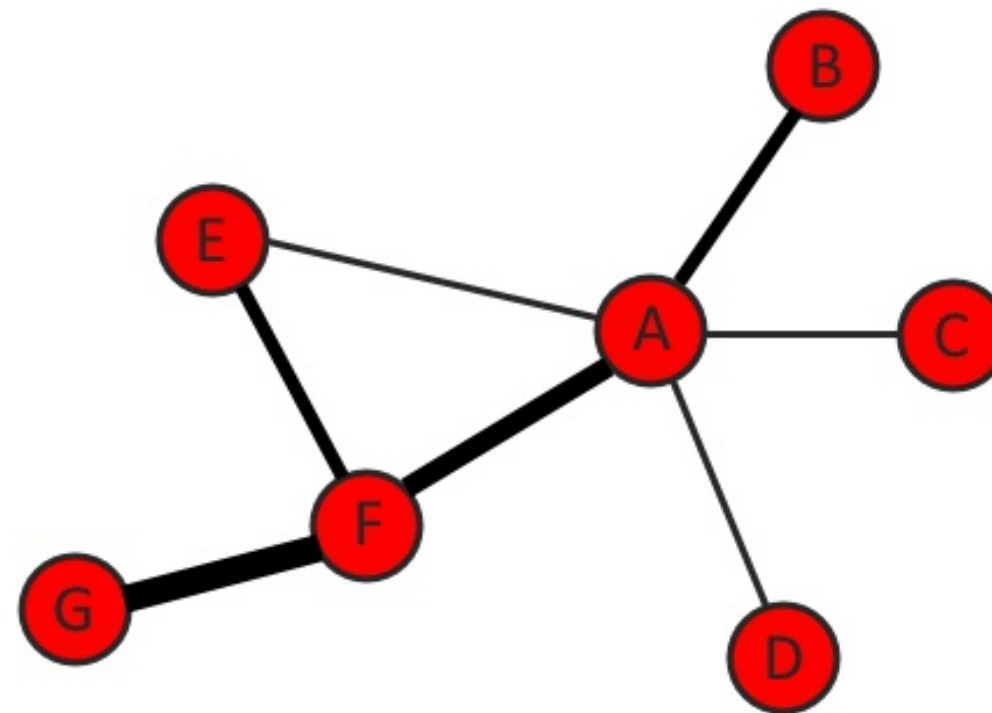
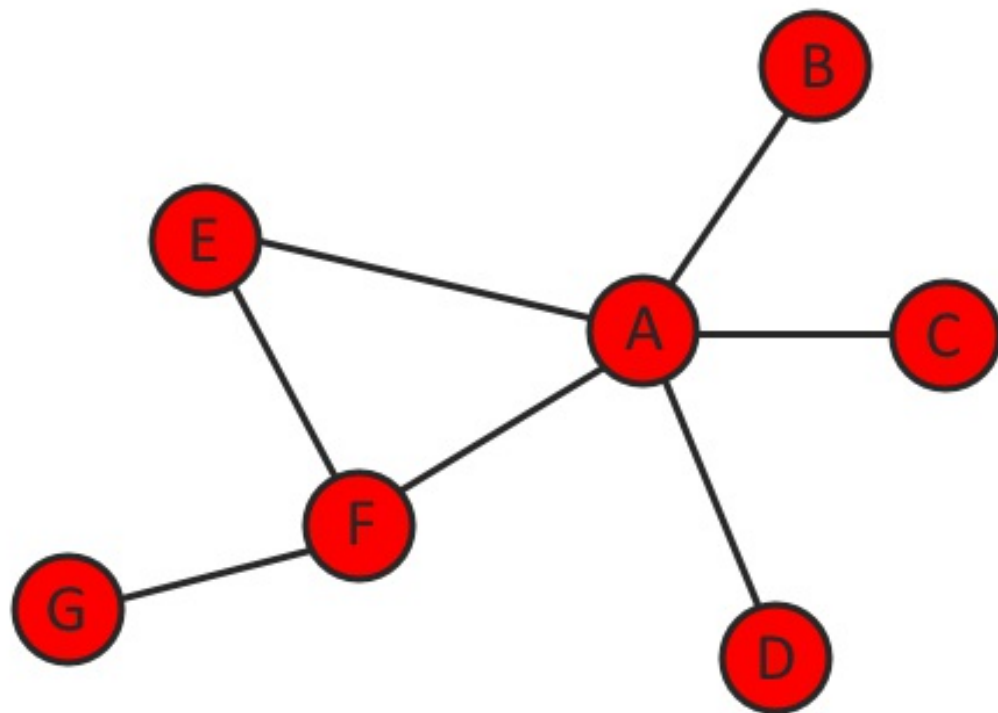


# Vertex Attributes



```
g
IGRAPH UN-- 7 7 --
+ attr: name (v/c)
+ edges (vertex names):
[1] A--B A--C A--D A--E A--F E--F F--G
```

# Edge Attributes





# Adding Attributes I

## Vertex Attributes

```
g <- set_vertex_attr(g, "age",  
  value = c(20,25,21,23,24,23,22))  
  
vertex_attr(g)  
  
$name  
[1] "A" "B" "C" "D" "E" "F" "G"  
  
$age  
[1] 20 25 21 23 24 23 22
```

## Edge Attributes

```
g <- set_edge_attr(g, "frequency",  
  value = c(2,1,1,1,3,2,4))  
  
edge_attr(g)  
  
$frequency  
[1] 2 1 1 1 3 2 4
```



# Adding attributes II

vertices.df

name	age
A	20
B	25
C	21
D	23
E	24
F	23
G	22

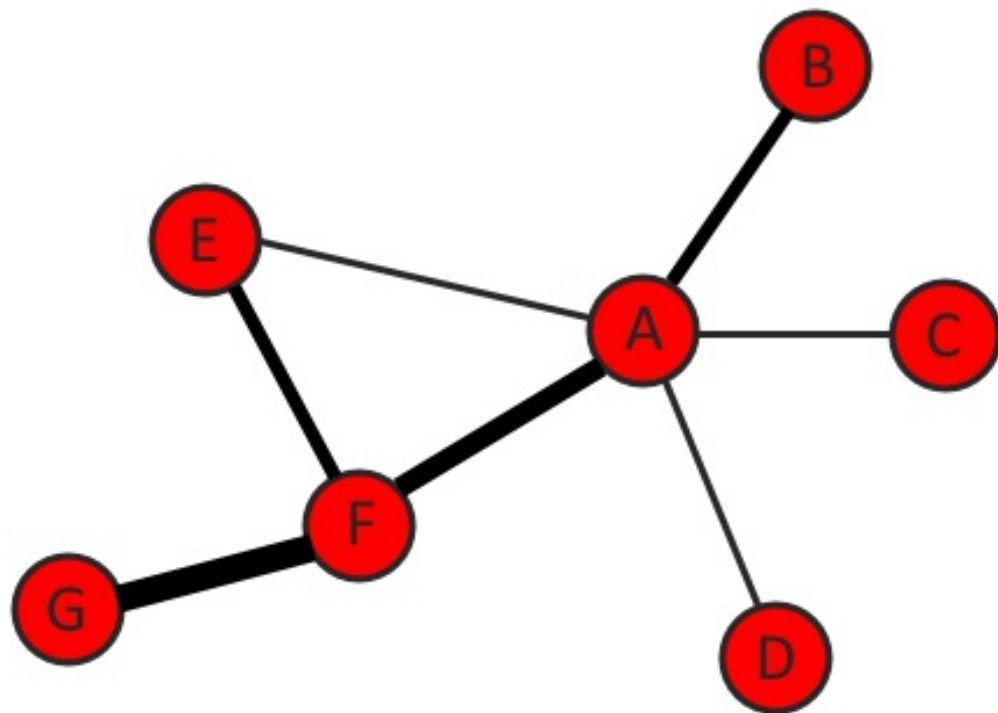
edges.df

from	to	frequency
A	B	2
A	C	1
A	D	1
A	E	1
A	F	3
E	F	2
F	G	4

```
graph_from_data_frame(d = edges.df, vertices = vertices.df, directed = FALSE)
```



# Subsetting Networks



```
E(g)[[inc('E')]]
```

```
+ 2/7 edges (vertex names):  
  tail head tid hid frequency  
4     E   A   5   1         1  
6     F   E   6   5         2
```

```
E(g)[[frequency>=3]]
```

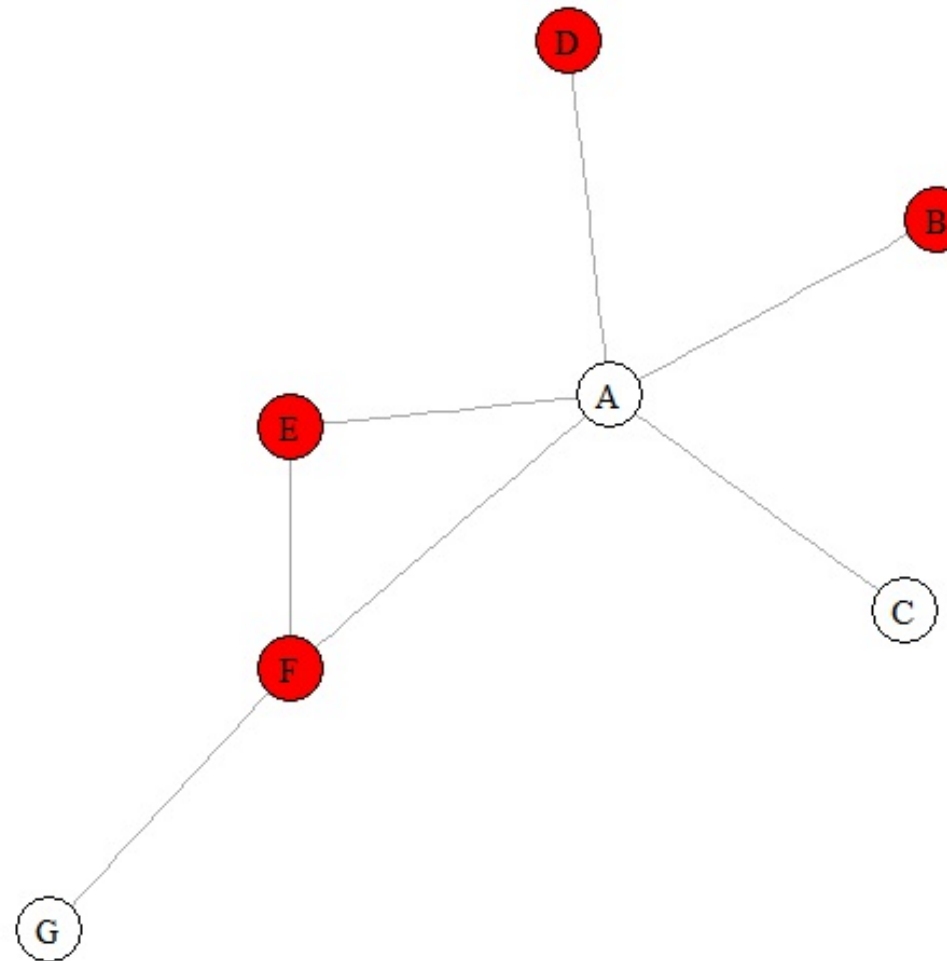
```
+ 2/7 edges (vertex names):  
  tail head tid hid frequency  
5     F   A   6   1         3  
7     G   F   7   6         4
```



# Network Visualization

```
V(g)$color <- ifelse(  
  V(g)$age > 22, "red", "white"  
)
```

```
plot(g, vertex.label.color = "black")
```





## NETWORK ANALYSIS IN R

**Let's practice!**



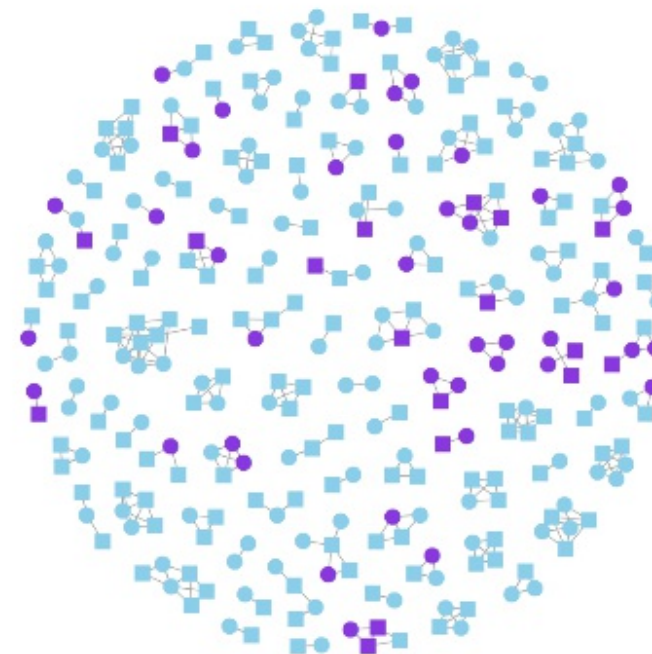
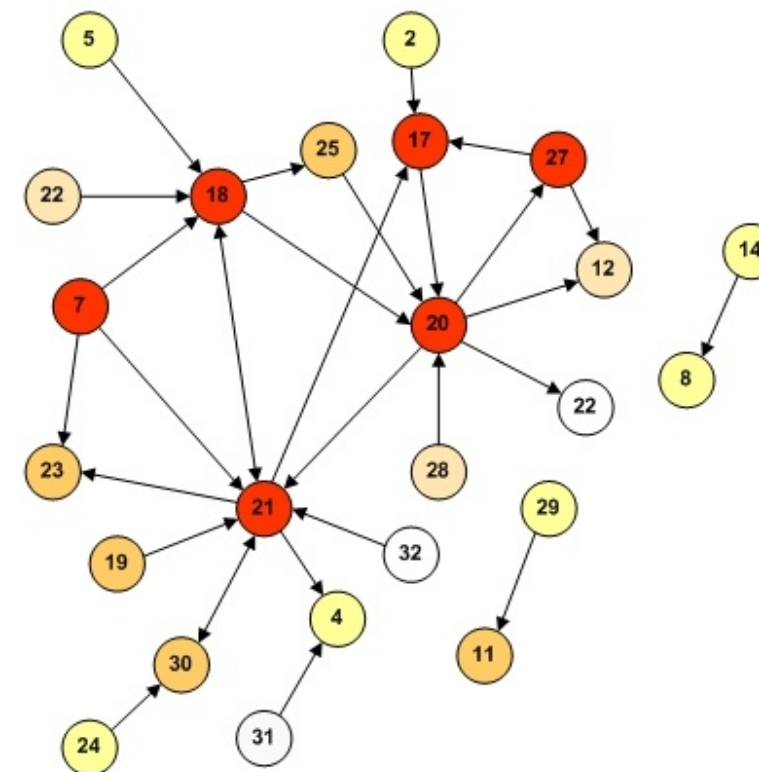
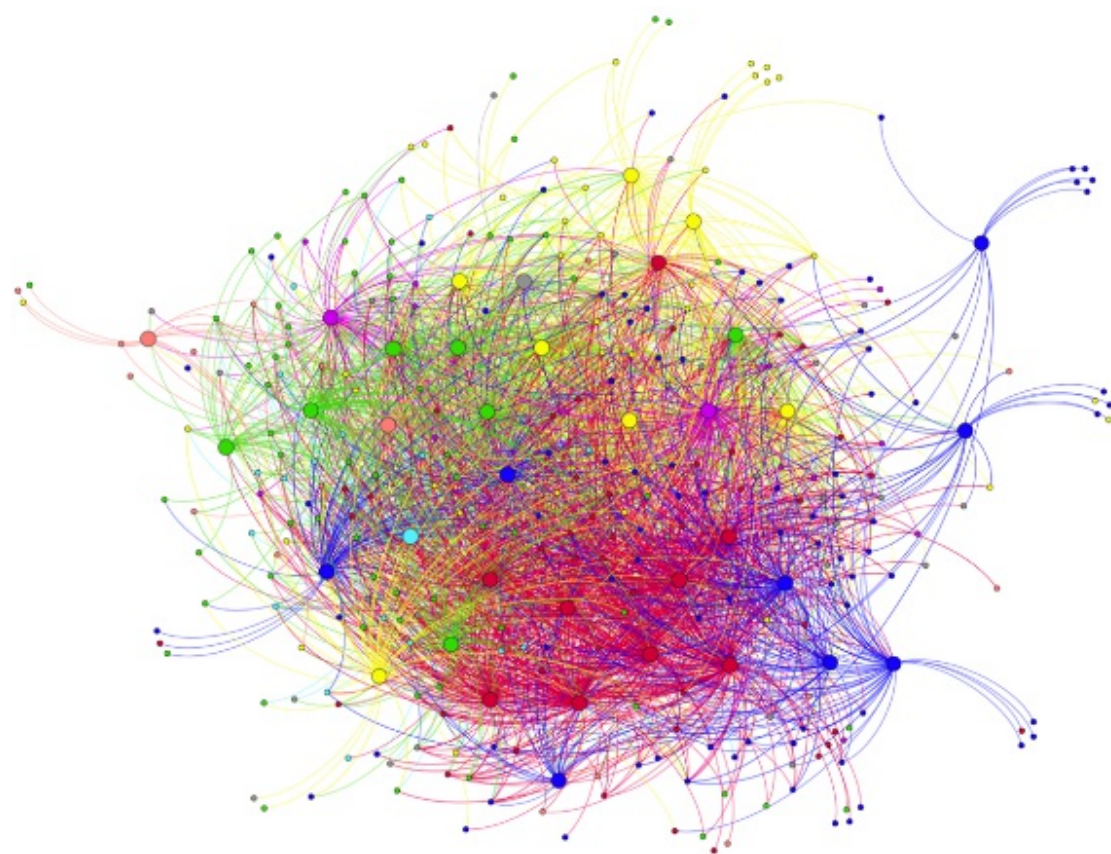
NETWORK ANALYSIS IN R

# Network Visualization

James Curley

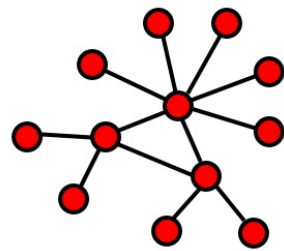
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University of Texas at Austin



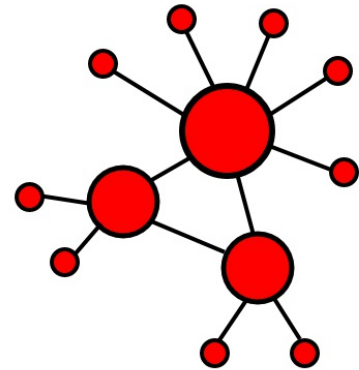


# Styling Vertices and Edges

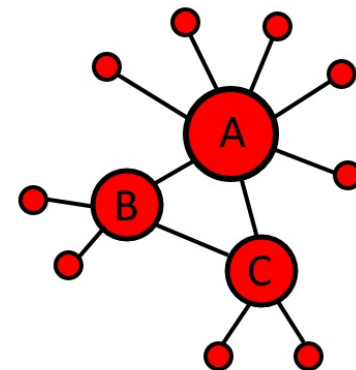
default



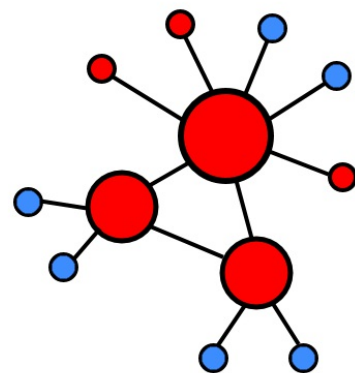
size



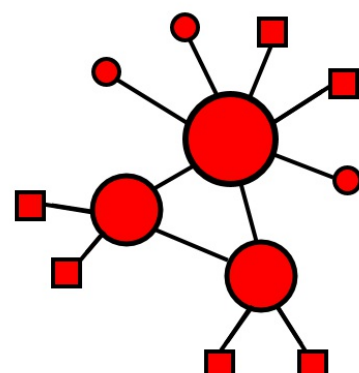
labels



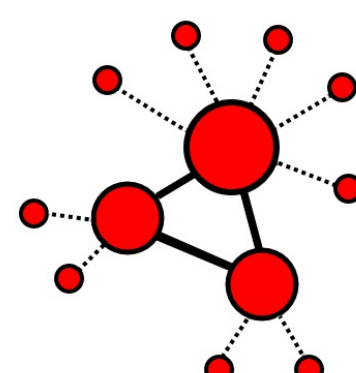
color



shape



edges



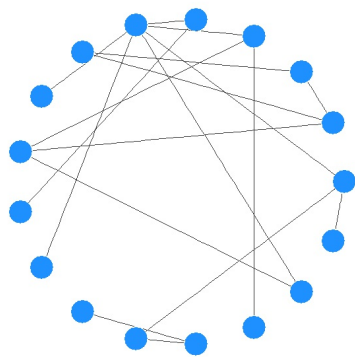


# Choosing the Appropriate Layout

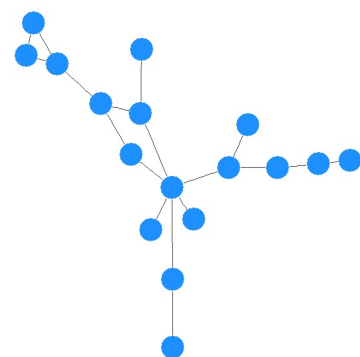
- Minimize edge crossing
- Do not allow vertices to overlap
- Make edge lengths as uniform as possible
- Increase symmetry of the network as much as possible
- Position more influential nodes towards the center

# igraph Layouts

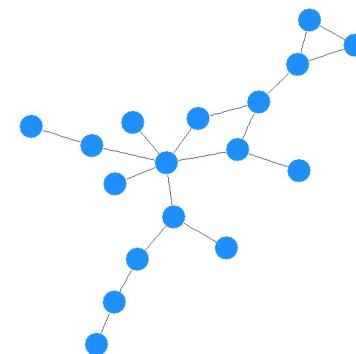
circle



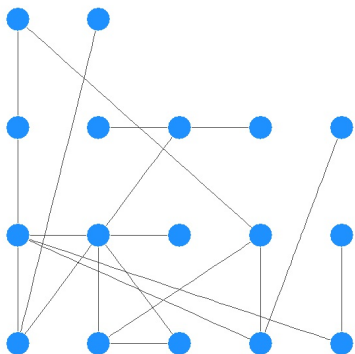
fruchterman-reingold



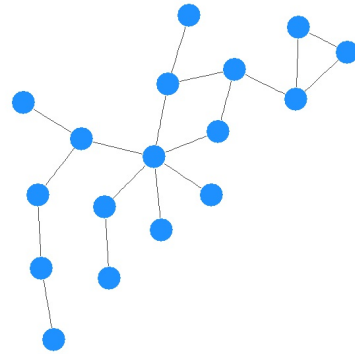
kamada-kawai



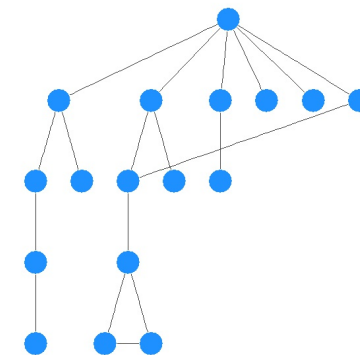
grid



lgl



tree



```
plot(g, layout = layout.fruchterman.reingold(g))
```



## NETWORK ANALYSIS IN R

**Let's practice!**