

Visualization of Different Graph and Graph Models

```
library(igraph)
```

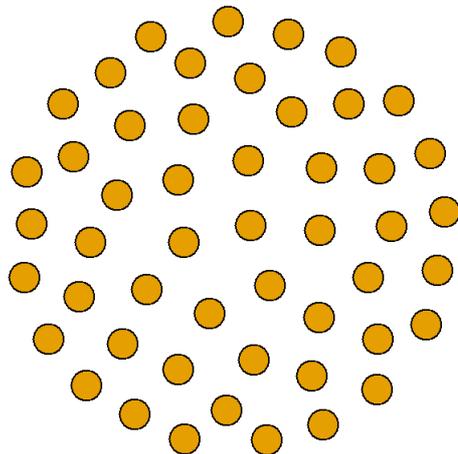
```
##  
## Attaching package: 'igraph'
```

```
## The following objects are masked from 'package:stats':  
##  
## decompose, spectrum
```

```
## The following object is masked from 'package:base':  
##  
## union
```

1. Creation of Empty Graph

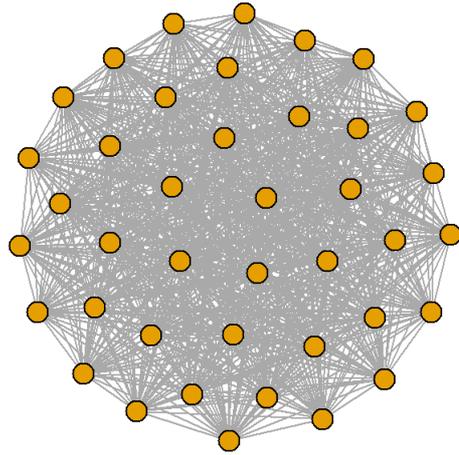
```
eg <- make_empty_graph(50)  
plot(eg, vertex.size=15, vertex.label=NA)
```



Result: An Empty graph with 50 vertices was formed

2. Creation of a full graph

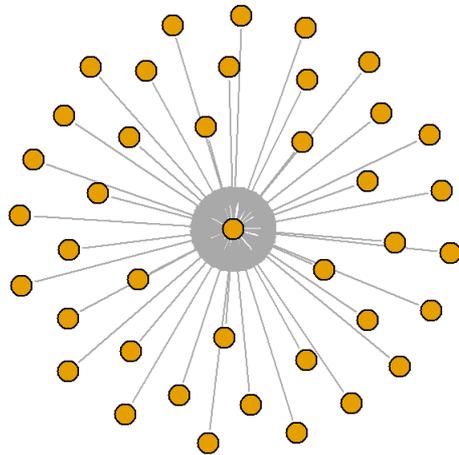
```
fg <- make_full_graph(40)  
plot(fg, vertex.size=10, vertex.label=NA)
```



Result: A full graph with 40 vertices was formed

3. Creation of a simple star graph

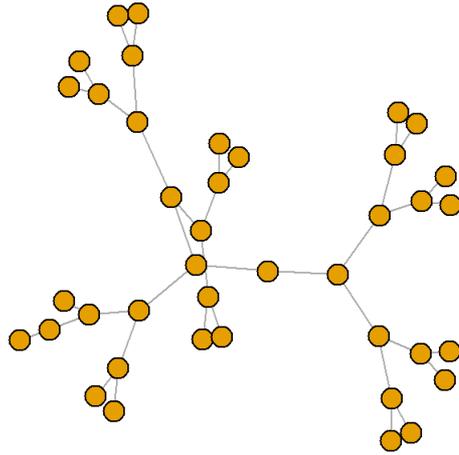
```
fg <- make_star(40)
plot(fg, vertex.size=10, vertex.label=NA)
```



Result: A star graph with 40 vertices was formed

4. Creation of Tree graph

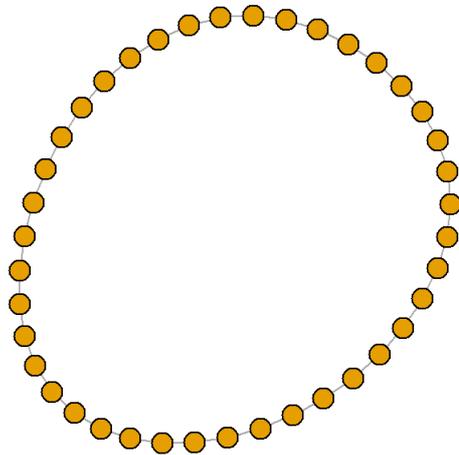
```
tr <- make_tree(40, children = 2, mode = "undirected")
plot(tr, vertex.size=10, vertex.label=NA)
```



Result: A tree graph with 40 nodes and 2 children each was formed

5. Creation of ring graph

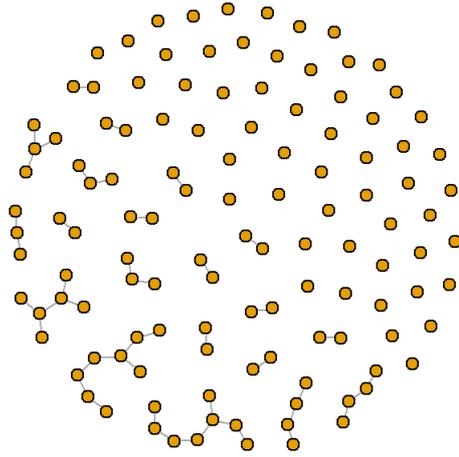
```
rn <- make_ring(40)  
plot(rn, vertex.size=10, vertex.label=NA)
```



Result: A ring graph with 40 vertices was formed

6. Creation of Erdos-Renyi random graph model

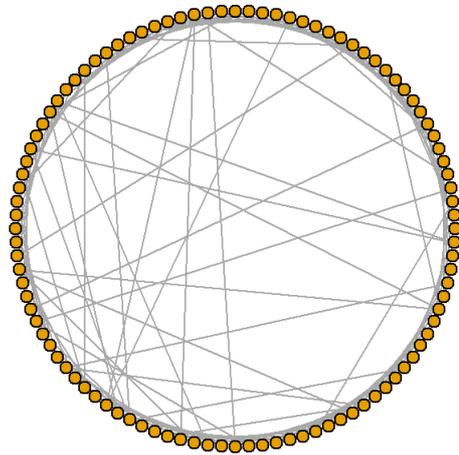
```
er <- sample_gnm(n=120, m=45)  
plot(er, vertex.size=6, vertex.label=NA)
```



Result: Erdos-Renyi random graph model was applied where $n=120$ is the number of nodes and $m=45$ is the number of edges

7. Creation of Watts-Strogatz small-world model

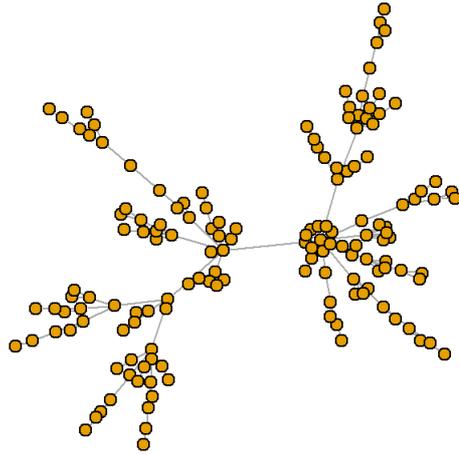
```
sw <- sample_smallworld(dim=2, size=10, nei=1, p=0.1)
plot(sw, vertex.size=6, vertex.label=NA, layout=layout_in_circle)
```



Result: Created a lattice (with $\text{dim}=2$ dimensions and $\text{size}=10$ nodes across dimension) and rewired the edges randomly with probability $p=0.1$. The neighborhood in which edges are connected is $\text{nei}=1$ with allowed loops and multiple edges.

8. creation of Barabasi-Albert preferential attachment model for scale-free graphs

```
ba <- sample_pa(n=150, power=1, m=1, directed=F)
plot(ba, vertex.size=6, vertex.label=NA)
```



Result: Created a graph where $n=150$ is number of nodes, $\text{power}=1$ is the power of attachment (1 is linear) and $m=1$ is the number of edges added on each time step

Conclusion: Various graphs like Empty graph, Full graph, Simple star graph, Tree graph, Ring graph and various graph models like Erdos-Renyi random graph model, Watts-Strogatz small-world model, Barabasi-Albert preferential attachment model for scale-free graphs were explored and visualized