

Network Analysis in R

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Preface

0.1 Node Analysis

Node analysis can be an important strategy at understanding connections in data.

0.2 Purpose

The purpose of this book is to speed the conversion of a traditional dataframe to a network diagram with nodes and vertices. Some discussion of basic computations will be included, but formulas are omitted unless necessary to convey meaning. Again, the emphasis is on producing insightful graphs of networks whose data was originally stored in a dataframe.

0.3 Collection

What follows is admittedly not the most original or insightful work on networks. It is an attempt to collect tutorials from disparate packages, software and websites in a single place. Attribution will be given where known.

0.4 Assumptions

A working knowledge of **R** is necessary including how to obtain and load packages and how to manipulate basic data structures like lists and dataframes. Methods and packages in the **tidyverse** are given priority.

Chapter 1

Introduction

Chapter 2

Defined

“A network is not just a metaphor: it is a precise, mathematical construct of nodes (vertices, actors) N and edges (ties, relations) E that can be directed or undirected.” (Jasney, 2018)

You can label chapter and section titles using `{#label}` after them, e.g., we can reference Chapter 1. If you do not manually label them, there will be automatic labels anyway, e.g., Chapter ??.

Figures and tables with captions will be placed in `figure` and `table` environments, respectively.

```
par(mar = c(4, 4, .1, .1))  
plot(pressure, type = 'b', pch = 19)
```

Reference a figure by its code chunk label with the `fig:` prefix, e.g., see Figure ??. Similarly, you can reference tables generated from `knitr::kable()`, e.g., see Table 2.1.

```
knitr::kable(  
  head(iris, 20), caption = 'Here is a nice table!',  
  booktabs = TRUE  
)
```

You can write citations, too. For example, we are using the **bookdown** package (Xie, 2020) in this sample book, which was built on top of R Markdown and **knitr** (?).

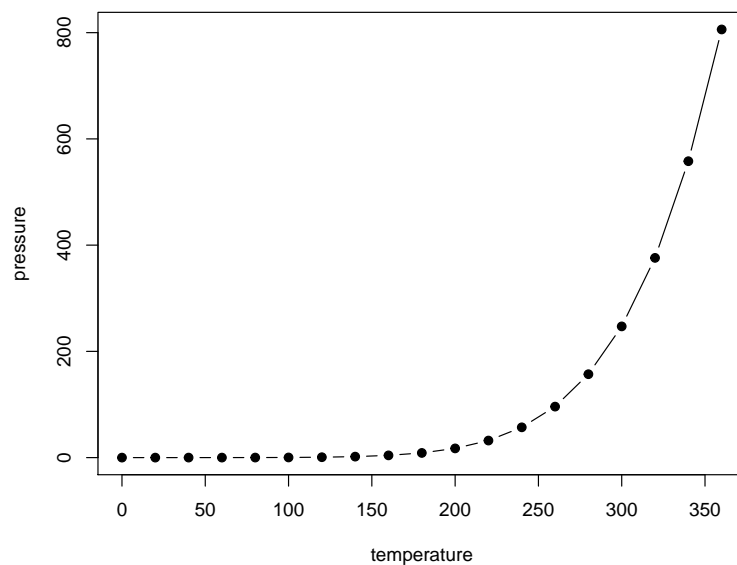


Figure 2.1: Here is a nice figure!

Table 2.1: Here is a nice table!

Sepal.Length	Sepal.Width	Petal.Length	Petal.Width	Species
5.1	3.5	1.4	0.2	setosa
4.9	3.0	1.4	0.2	setosa
4.7	3.2	1.3	0.2	setosa
4.6	3.1	1.5	0.2	setosa
5.0	3.6	1.4	0.2	setosa
5.4	3.9	1.7	0.4	setosa
4.6	3.4	1.4	0.3	setosa
5.0	3.4	1.5	0.2	setosa
4.4	2.9	1.4	0.2	setosa
4.9	3.1	1.5	0.1	setosa
5.4	3.7	1.5	0.2	setosa
4.8	3.4	1.6	0.2	setosa
4.8	3.0	1.4	0.1	setosa
4.3	3.0	1.1	0.1	setosa
5.8	4.0	1.2	0.2	setosa
5.7	4.4	1.5	0.4	setosa
5.4	3.9	1.3	0.4	setosa
5.1	3.5	1.4	0.3	setosa
5.7	3.8	1.7	0.3	setosa
5.1	3.8	1.5	0.3	setosa

Chapter 3

Literature

Here is a review of existing methods.

Chapter 4

First Graphs

4.1 Les Miserable Dataset

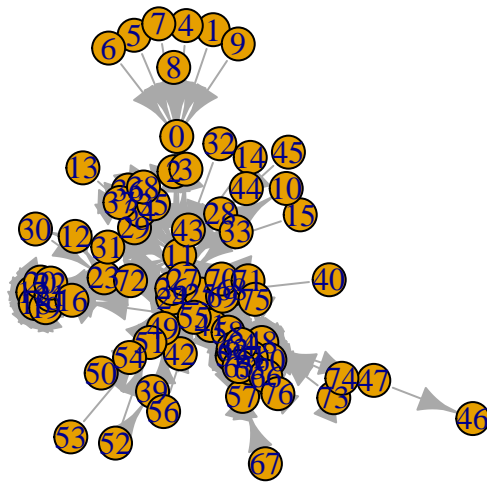
```
# Load igraph
library(igraph)

# Read data
lesmis <- read.csv("https://raw.githubusercontent.com/meefen/sna-ed/master/assets/lesmis/lesmis.csv")
# check the head (first 6 rows) of the dataset
head(lesmis)
```

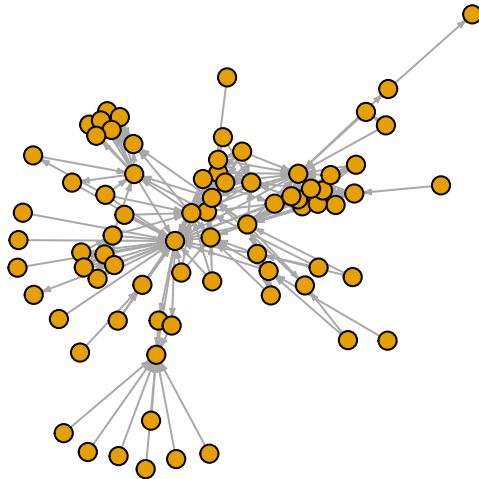
```
##   Source Target weight
## 1      1      0       1
## 2      2      0       8
## 3      3      0      10
## 4      3      2       6
## 5      4      0       1
## 6      5      0       1
```

```
# Create a graph using the graph_from_data_frame function
g <- graph_from_data_frame(lesmis)

# Plot the graph
plot(g)
```



```
# make the graph a little prettier
plot(g, edge.arrow.size=.2, vertex.label=NA, vertex.size=8)
```



4.2 Stop light

```
library(sigmajs)
library(tibble)

##
## Attaching package: 'tibble'

## The following object is masked from 'package:igraph':
##
##      as_data_frame
```

```
edges <- tibble(id = rep("1", 3),
               source = rep("1", 3),
               target = as.character(c(2:4))
               )
nodes <- tibble(id = as.character(1:4),
               label = c("light", "red", "yellow", "green"),
               time = c(100, 30, 10, 20)
               )
sigmajs() %>%
  sg_nodes(nodes, id, label, time) %>%
  sg_edges(edges, id, source, target)
```

4.3 Les Miserabe

Chapter 5

Sigma JS

```
#example for ?sigmajs::sigmajs  
library(sigmajs)  
nodes <- sg_make_nodes()  
edges <- sg_make_edges(nodes)  
  
sigmajs() %>%  
  sg_nodes(nodes, id, label, size, color) %>%  
  sg_edges(edges, id, source, target)
```

5.1 Stop light

```
library(sigmajs)
library(tibble)
edges <- tibble(id = rep("1", 3),
                 source = rep("1", 3),
                 target = as.character(c(2:4))
                 )
nodes <- tibble(id = as.character(1:4),
                label = c("light", "red", "yellow", "green"),
                time = c(100, 30, 10, 20)
                )
```

```
sigmajs() %>%  
  sg_nodes(nodes, id, label, time) %>%  
  sg_edges(edges, id, source, target)
```


Chapter 6

Glossary

Attributes are a characteristic of the node or edge that is often designated by color, size, or shape of the object. For example, a dashed line for an edge or a blue circle for a node.

Nodes are also actors or vertices. They are things like people, places, ideas that have some connection. In mathematical formulas, they often take the variable N .

Degree the number of nodes adjacent to the node under evaluation or the number of lines incident to it.

Diameter is the maximum number of edges.

Edges are ties, relations or connections between nodes. Edges are often designated as E .

Indegree is the number of received ties.

Networks

Network objects is a class of objects in R designed specifically for network analysis. They store an adjacency matrix or an edgelist as well as metadata.

Outdegree the number of sent ties.

Directed networks

Bibliography

Jasney, L. (2018). Introduction to Social Network Analysis in R.

Xie, Y. (2020). *bookdown: Authoring Books and Technical Documents with R Markdown*. R package version 0.21.