Network Definition
–Seminar–

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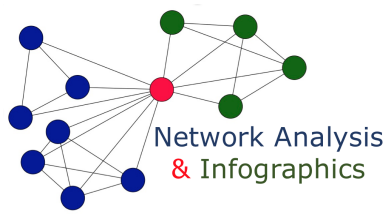

Week 2: 3 February 2022

Overview

1. R objects
2. R operators
3. Importing/exporting data in R

Ready ...?

Ready ...?

R and RStudio

On campus

1. Go to http://rstudio.uscs.susx.ac.uk/
2. Access the website by using your University of Sussex account

On your personal computer

1. Install R
2. Install RStudio

RStudio cloud

1. Go to `https://rstudio.cloud`
2. Register and sign in

Ready ...?
Installing igraph

Through the RStudio interface:

1. Tools
2. Install Packages
3. Search for igraph
4. Tick the box "Install Dependencies"
5. Install

or

Through the RStudio console

```
1 install.packages("igraph")
2 library("igraph")
```

R objects

R objects

- R is an object-oriented language
- R creates and manipulate objects
- Different types or classes of objects
- The most used objects are
  - Data objects
  - Function objects
- Objects have attributes
- Objects are stored in a workspace called *environment* in RStudio

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- numeric
  (*1.5*, *-102*, *0.001*, *...*)

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  (*1.5, -102, 0.001, ...*)
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  (*1, -4, 4, ...*)

R objects
Data objects

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R objects
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Data **structure**

Data **structure**

- vector: an ordered collection of values

$$\mathbf{a} = \begin{pmatrix} 0 \\ 20 \\ 30 \\ -4 \\ 12 \end{pmatrix}$$

$$\mathbf{a} = \begin{pmatrix} \textit{Peter} \\ \textit{Sara} \\ \textit{Andrew} \\ \textit{Charlotte} \\ \textit{Rachel} \end{pmatrix}$$

Data **structure**

- vector: an ordered collection of values
- matrix: a 2-dimensional vector
  (a vector with > 2 dimensions is called array)

$$\mathbf{A} = \begin{pmatrix} 0 & 10 & 20 \\ 20 & -2 & 10 \\ 30 & -10 & 5 \\ -4 & 0 & 0 \\ 12 & -23 & 2 \end{pmatrix}$$

Data **structure**

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- matrix: a 2-dimensional vector
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- data frame: variables and observations

Table: Students in 2021/22

Student	Course
Student 1	SD
Student 2	STP
Student 3	SD
Student 4	SIM
Student 5	SD
Student 6	STP
Student 7	SD
Student 8	SD
Student 9	SIM
Student 10	SIM
Student 11	SD
Student 12	STP
Student 13	SD
Student 14	STP
Student 15	SD
Student 16	SIM
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Student 18	SD
Student 19	SIM
Student 20	SIM

R objects
Data objects

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- data frame: variables and observations
- list: an ordered sequences of objects

$$\mathbf{a} = \begin{pmatrix} 0 \\ 20 \\ 30 \\ -4 \\ 12 \end{pmatrix}$$

$$\mathbf{b} = \begin{pmatrix} red \\ red \\ green \\ yellow \\ yellow \end{pmatrix}$$

$$\mathbf{A} = \begin{pmatrix} 0 & 10 & 20 \\ 20 & -2 & 10 \\ 30 & -10 & 5 \\ -4 & 0 & 0 \\ 12 & -23 & 2 \end{pmatrix}$$

Data **structure**

- vector: an ordered collection of values
- matrix: a 2-dimensional vector
  (a vector with > 2 dimensions is called array)
- data frame: variables and observations
- list: an ordered sequences of objects
- factor: categorical data (e.g. "male", "female")

$$\mathbf{a} = \begin{pmatrix} red \\ red \\ green \\ yellow \\ yellow \end{pmatrix}$$

factors = green, red, yellow

R objects
Functions

- A function is a command in R that returns a given outcome
- Functions can read, manipulate and analyse data
- Certain base functions are already integrated in the basic R
- Packages provide users with additional functions (e.g. igraph)

plot()

mean()

read_csv(...)

write_csv(...)

...

R objects
Attributes

- name: the name of the object
- mode: the type of data
- length: number of elements in the object
- ..

R operators

R operators

Arithmetic operators

Operator	Description
+	addition
−	subtraction
*	multiplication
/	division
^	exponentiation

R operators

Logical operators

Operator	Description
$<$	less than
$<=$	less than or equal to
$>$	greater than
$>=$	greater than or equal to
$==$	equal to
$!=$	not equal to
$!x$	Not x
$x \vert y$	x OR y
$x \& y$	x AND y

R operators

Let's explore objects and operators in RStudio

Importing/exporting data in R

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  - "haven" (STATA, SPSS, SAS)

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  - "tidyverse"
- Install these packages in R (you should now know how to do it)

Importing/exporting data in R

Let's import/export data in RStudio

Next time ...

Next time ...

- **Lecture: Network data collection**
  - Main approaches to collect and sample network data
  - Network boundary specification problem

- **Seminar: Network data collection**
  - Network file formats
  - How to create/import and manipulate network data in igraph

Questions