Introduccion a R y RStudio
Taller de Introduccion a R y manejo de informacion grillada

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¿Qué es R?

"R es un lenguaje y entorno de libre acceso para la computación estadística y gráficos que proporciona una amplia variedad de técnicas estadísticas y gráficas: modelado lineal y no lineal, pruebas estadísticas, análisis de series temporales, clasificación, clustering, etc."
- **R core group**

https://cloud.r-project.org/
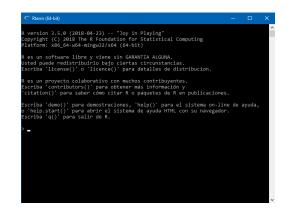

https://www.rstudio.com/products/
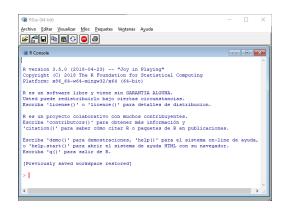rstudio/download/

R

https://www.r-project.org/
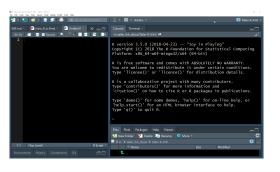
https://www.r-project.org/

RStudio

https://www.rstudio.com/

Librerías

```r
#install.packages('beepr', repos = 'https://cloud.r-project.org')
library(beepr)
```

```
## Warning: package 'beepr' was built under R version 3.5.1
#beep(sound = 8)
```

Librerías

```
install.packages('raster')
install.packages('openxls')
install.packages('ncdf4')
install.packages('lubridate')
```

Tipos de objetos en R

Vector númerico

```
precipitacion <- c(6, 7, 24, 17, 20.5, 20.5, 20, 12, 11, 14, 38,
                  9.5, 8, 5.5, 7)
head(precipitacion)
```

```
## [1]  6.0  7.0 24.0 17.0 20.5 20.5
```

Vector de caracteres

```
fecha <- c('1991-01-01', '1991-01-02', '1991-01-03', '1991-01-04',
           '1991-01-05', '1991-01-06', '1991-01-07', '1991-01-08',
           '1991-01-09', '1991-01-10', '1991-01-11', '1991-01-12',
           '1991-01-13', '1991-01-14', '1991-01-15')
head(fecha, 4)
```

```
## [1] "1991-01-01" "1991-01-02" "1991-01-03" "1991-01-04"
```

Tipos de objetos en R

Factores

```
(valores <- factor(c('b', 'b', 'd', 'c', 'd'),
                   levels = c('a', 'b', 'c', 'd')))
```

```
## [1] b b d c d
## Levels: a b c d
table(valores)
```

```
## valores
## a b c d
## 0 2 1 2
```

Variables lógicas

```
a <- 2
b <- 3
a == b # ¿es a igual a b?
```

```
## [1] FALSE
```

Tipos de objetos en R

Matrices

```
(A <- matrix(c(-67, -16, -68.5, -17.5), byrow = FALSE, ncol = 2))

##      [,1]   [,2]
## [1,] -67  -68.5
## [2,] -16  -17.5
```

Data frames

```
datos <- data.frame(fecha, precipitacion)
head(datos)

##        fecha precipitacion
## 1 1991-01-01           6.0
## 2 1991-01-02           7.0
## 3 1991-01-03          24.0
## 4 1991-01-04          17.0
## 5 1991-01-05          20.5
## 6 1991-01-06          20.5
```

Tipos de objetos en R

Listas

```r
(mi_lista <- list(matriz = A, data_frame = datos))
```

```
## $matriz
##      [,1]  [,2]
## [1,]  -67 -68.5
## [2,]  -16 -17.5
##
## $data_frame
##         fecha precipitacion
## 1  1991-01-01           6.0
## 2  1991-01-02           7.0
## 3  1991-01-03          24.0
## 4  1991-01-04          17.0
## 5  1991-01-05          20.5
## 6  1991-01-06          20.5
## 7  1991-01-07          20.0
## 8  1991-01-08          12.0
## 9  1991-01-09          11.0
```

Tipos de objetos en R

Fechas

```
class(fecha)
## [1] "character"
fecha_formato <- as.Date(fecha) # ojo!
head(fecha_formato, 4)
## [1] "1991-01-01" "1991-01-02" "1991-01-03" "1991-01-04"
class(fecha_formato)
## [1] "Date"
```

Indexacion

Vector

```
fecha_formato[2]
```

```
## [1] "1991-01-02"
```

Matriz y data frame

```
datos[1,2]
```

```
## [1] 6
```

```
head(datos[,2], 11)
```

```
## [1]  6.0  7.0 24.0 17.0 20.5 20.5 20.0 12.0 11.0 14.0 38.0
```

Indexacion

Listas

```
mi_lista[1]
```

```
## $matriz
##      [,1] [,2]
## [1,]  -67 -68.5
## [2,]  -16 -17.5
mi_lista[[1]]
##      [,1] [,2]
## [1,]  -67 -68.5
## [2,]  -16 -17.5
```

Manipulacion de informacion

									Latitud Sud:	16° 29' 43"			
Estación:	San Calixto								Longitud Oeste:	68° 7' 57"			
Departamento:	La Paz								Altitud m/s/m:	3658			
Provincia:	Murillo												
				DATOS DE : PRECIPITACIÓN DIARIA (mm)									
					1981								
DIA	ENE	FEB	MAR	ABR	MAY	JUN	JUL	AGO	SEP	OCT	NOV	DIC	TOTAL
1	8.0	0.3	8.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	19.2
2	0.8	4.5	1.6	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.9
3	11.9	0.0	3.0	0.0	0.0	0.0	0.0	0.0	1.4	0.0	0.0	4.7	21.0
4	22.4	0.0	0.3	0.0	0.0	0.0	0.0	0.0	22.8	0.0	0.0	0.2	45.7
5	8.1	0.0	2.1	0.0	0.0	0.0	0.0	3.7	0.0	9.4	3.2	0.0	26.5
6	1.0	18.2	2.3	0.7	0.0	0.0	0.0	9.4	0.0	0.7	1.5	0.0	33.8
7	0.0	29.1	13.1	3.8	0.0	0.0	0.0	1.4	0.0	5.0	0.0	0.0	52.4
8	3.6	3.5	12.1	0.0	0.0	0.0	0.0	0.3	0.0	8.5	6.6	0.0	34.6
9	1.1	7.4	17.8	10.2	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	37.3
10	7.8	6.3	0.5	11.3	0.0	0.0	0.0	9.1	0.0	0.0	0.0	0.0	35.0
11	3.8	0.0	0.0	20.5	2.2	0.0	0.0	0.0	0.6	0.0	0.0	2.0	29.1
12	3.7	0.0	6.8	0.0	0.7	0.0	0.0	0.4	0.1	0.0	0.0	0.0	11.7
13	5.7	19.0	0.3	1.3	0.0	0.0	0.0	0.0	0.0	0.0	1.6	0.0	27.9
14	5.3	2.6	0.0	0.0	0.0	0.0	0.0	1.4	0.0	0.0	0.0	0.0	9.3
15	1.9	3.1	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.0	2.2	8.1
16	22.8	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.6	24.4
17	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.7
18	9.4	0.0	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	11.2
19	7.8	0.5	3.4	0.0	0.0	0.0	0.0	0.0	2.0	0.0	3.3	1.7	18.7
20	0.5	11.5	0.0	0.0	1.3	0.0	0.0	0.0	0.7	0.0	0.0	1.1	15.1
21	4.7	0.1	0.0	0.0	0.0	0.0	0.0	0.0	8.3	0.8	0.5	7.0	21.4
22	0.0	5.0	0.6	0.0	0.0	0.0	0.0	0.0	0.9	3.5	0.0	0.0	10.0
23	0.0	0.3	1.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	1.5	2.0	4.9
24	0.0	13.8	0.0	0.0	0.0	0.0	0.0	0.0	8.7	6.0	0.3	2.7	31.5
25	0.0	4.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5	7.7	0.0	15.5
26	7.1	3.2	0.3	0.0	0.0	0.0	0.0	0.0	5.5	6.6	0.0	2.0	24.7
27	19.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.2	0.0	3.5	37.4
28	2.6	4.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.3	0.2	0.0	11.4
29	0.0	****	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	4.1	4.9
30	0.0	****	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.3	0.0	6.0	6.3
31	0.0	****	0.0	****	0.0	****	0.0	0.0	****	6.8	****	0.4	7.2
SUM	159.0	137.7	75.4	48.8	4.2	0.0	0.0	27.4	51.1	70.3	28.0	42.9	644.8
MED	7.2	6.9	4.2	7.0	1.4	0.0	0.0	3.0	4.6	5.0	2.3	2.5	4.4
MAX	22.8	29.1	17.8	20.5	2.2	0.0	0.0	9.4	22.8	14.2	7.7	7.0	29.1
MIN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
N	22.0	20.0	18.0	7.0	3.0	0.0	0.0	9.0	11.0	14.0	12.0	17.0	133.0
					AÑO: 1982								
DIA	ENE	FEB	MAR	ABR	MAY	JUN	JUL	AGO	SEP	OCT	NOV	DIC	TOTAL
1	1.0	0.0	11.7	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.5	0.0	14.2
2	0.4	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6	0.0	2.1
3	12.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.6
4	6.4	0.0	24.2	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.6	31.5
5	5.6	0.0	3.7	3.8	0.0	0.0	0.0	0.0	0.0	2.7	0.3	0.0	27.6
6	2.4	0.0	0.0	11.9	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.5	15.3
7	9.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5	12.6
8	6.7	1.7	0.0	0.5	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.6	10.5

fecha	San_Calixto
01/01/1981	8
02/01/1981	0.8
03/01/1981	11.9
04/01/1981	22.4
05/01/1981	8.1
06/01/1981	1
07/01/1981	0
08/01/1981	3.6
09/01/1981	1.1
10/01/1981	7.8
11/01/1981	3.8
12/01/1981	3.7
13/01/1981	5.7
14/01/1981	5.3
15/01/1981	1.9
16/01/1981	22.8
17/01/1981	0
18/01/1981	9.4
19/01/1981	7.8
20/01/1981	0.5
21/01/1981	4.7
22/01/1981	0
23/01/1981	0
24/01/1981	0
25/01/1981	0
26/01/1981	7.1
27/01/1981	19
28/01/1981	2.6
29/01/1981	0
30/01/1981	0
31/01/1981	0
01/02/1981	0.3
02/02/1981	4.5
03/02/1981	0
04/02/1981	0
05/02/1981	0
06/02/1981	18.2
07/02/1981	29.1
08/02/1981	3.5
09/02/1981	7.4
10/02/1981	6.3
11/02/1981	0
12/02/1981	0
13/02/1981	19

Slide with Plot