```
enject to mirror
        peration == "MIRROR_X":
       mirror_mod.use_x = True
       mirror_mod.use_y = False
       irror_mod.use_z = False
        _operation == "MIRROR_Y"
       Lrror_mod.use_x = False
       lrror_mod.use_y = True
        mirror_mod.use_z = False
         operation == "MIRROR Z";
         rror mod.use x = False
         lrror_mod.use_y = False
         rror mod.use z = True
         election at the end -add
          ob.select= 1
         er ob.select=1
R for the Infrequent UseR
          nta.objects[one.name].se
         int("please select exact
           OPERATOR CLASSES Shannon Dunnigan
                             GTMNERR
          ject.mirror_mirror_x"
         FOR X
                     t to not
```

A Recap of Yesterday



- A Reintroduction to R and RStudio, installation and updates
- Best Practices for a Reproducible Workflow
 - Use an IDE
 - Save the source, not the workspace (but some modular approaches may be necessary)
 - Project-oriented workflows (and using RStudio Projects)
 - Use safe paths and the `here` package
 - Use standardized naming conventions and the `janitor` package
 - Use a consistent coding style
- Additional Best Practice Tips
 - Leave it in the data frame
 - Tidy Data
 - Going from spreadsheets to coding







Helping with a function

When you know the name of the function

1. Use the help function

```
help(geom_point)
```

2. Use '?'

When you don't know the name

Search the R Help files

```
help.search("anova")
```



How to read a Help File

Title

Description

Usage

Arguments

Details

Value

See also

Examples

Typical sections in an R Help File

RStudio IDE:: CHEAT SHEET

Documents and Apps

Open Shiny, R Markdown, knitr, Sweave, LaTeX, Rd files and more in Source Pane

Show file Visual cuttine chunk chunk code churés code chur section or chunk

Access markdown guide at Help > Markdown Quick Reference

RStudio recognizes that files named app.R. server,R. ui.R. and global,R belong to a shiny app

Run Choose Publish to Manage app location to shinyapps to publish

Data import with

Read Tabular Data with readr

A B C

read_*(file, col_names = TRUE, col_types = NULL, col_select = NU skip = 0, na = c("", "NA"), guess_max = min(1000, n_max), show

read_delim("file.txt", delim = delimiter is specified, it will auto To make file.txt, run; write file("Al 4|5|NA A B C decimal marks.

read_csv("file.csv") Read a com 1,2,3 write file("A,B,C\n1,2,3\n4,5,NA", 4,5,NA

read_csv2("file2.csv") Read ser decimal marks. 1,5;2;3 write_file("A;B;C\n1,5;2;3\n4.5;5;N 4,5;5;NA read_tsv("file.tsv") Read a tab

read_fwf("file.tsv", fwf_widths 123 write_file("A\tB\tC\n1\t2\t3\n4\t5 4 5 NA

USEFUL READ ARGUMENTS

No header read_csv("file.csv", col_names = FALSE) 1 2 3 4 5 NA 4 5 1 Provide header col names = c("x", "y", "z")) A B

4 5 Read multiple files into a single table read_csv(c("f1.csv", "f2.csv", "f3.csv"), A;B;C id = "origin_file") 1,5;2;3,0

Save Data with readr

write_*(x, file, na = "NA", append, col_names, quote, escape, eol,



write_delim(x, file, delim = " write_csv(x, file) Write a comr write_csv2(x, file) Write a sen write_tsv(x, file) Write a tab d

Studio RStudio® is a trademark of R

Source Editor

previous code w/out Echo or outline

as a Local Job

Source with or Show file

ggplot2 is based on the grammar of graphics, the idea

and geoms-visual marks that represent data points.

To display values, map variables in the data to visual

system

Complete the template below to build a graph.

<GEOM_FUNCTION> (mapping = aes < MAR

ggplot(data = mpg, aes(x = cty, y = hwy)) Begins a plot

ggsave("plot.png", width = 5, height = 5) Saves last plot as $5' \times 5'$ file named "plot.png" in working directory.

linetype - integer or string (0 = "blank", 1 = "solid", 2 = "dashed", 3 = "dotted", 4 = "dotdash", 5 = "longdash",

shape - integer/shape name or 13 14 15 16 17 18 19 20 21 22 23 24 25

that you finish by adding layers to. Add one geom

stat = <STAT>, position = <POSITION>) -

ggplot (data = <DATA>) +

<FACET FUNCTION> +

<SCALE_FUNCTION>+

<THEME_FUNCTION>

function per layer.

6 = "twodash")

<COORDINATE_FUNCTION> +

last_plot() Returns the last plot.

Matches file type to file extension.

Aes Common aesthetic values.

color and fill - string ("red", "#RRGGBB")

lineend - string ("round", "butt", or "square")

linejoin - string ("round", "mitre", or "bevel")

properties of the geom (aesthetics) like size, color, and x

that you can build every graph from the same

components: a data set, a coordinate system.

Open in new Save Find and Compile as Run

Basics

and y locations.

Jump to fu



workspace workspace

Data visualization with gg



Geoms Use a geom fu

GRAPHICAL PRIMITIVES

a <- ggplot(economics, aes(d

a + geom blank Ensure limits in

b+geom cui xend = long ·

alpha, angle

a + geom_

linejoin =

color, fil

b + geom

ymax, ymi

a + geom_

alpha, colo

b + geom_abline

b + geom_segment(aes(yend =

b + geom_spoke(aes(angle = 1:1)

ONE VARIABLE continuous

c + geom_dotplot()

x, y, alpha, color, fill

c + geom_freqpoly()

discrete

d <- ggplot(mpg, aes(fl))

c <- ggplot(mpg, aes(hwy)); c2 <- ggplot(mpg)

c + geom_area(stat = "bin")

x, y, alpha, color, fill, linetype, size

c + geom_density(kernel = "gaussian")

x, y, alpha, color, group, linetype, size

c + geom histogram(binwidth = 5)

c2 + geom_gg(aes(sample = hwv))

x, y, alpha, color, fill, linetype, size, weight

x, y, alpha, color, fill, linetype, size, weight

x, alpha, color, fill, linetype, size, weight

x, y, alpha, color, fill, group, linetype, size, weight

b + geom_hline(a

b + geom_vline(aes

LINE SEGMENTS

common aesthetics: x.

x, y, alpha,

b <- ggplot(seals, aes(x = lo

Version

Turn on at Tools > Project Options > Git/SVN Commit Push/Pull View Current staged files to remote History branch

dplyr functions work w

Each variable is in E

Data t rmarkdown:: cheat sheet

What is rmarkdown?



is a way to organize t

tidy if:

AN ENHANCED

CONSTRUCT A TIBBLE

2, "b",

3, "c")

tribble(~x ~v

tibble(...) Construct by columns.

tibble(x = 1:3, y = c("a", "b", "c"))

tribble(...) Construct by rows.

x, y, alpha, color, fill

t data structure across

View() or glimpse() View the entire data set.

as_tibble(x, ...) Convert a data frame to a tibble

Convert a named vector to a tibble. Also deframe().

enframe(x, name = "name", value = "value")

is tibble(x) Test whether x is a tibble

e RStudio IDE by

Console Terminal × R Markdown

RENDERED OUTPUT file path to output document **Document Title** rpubs.com, uthor Name Including Plots R Markdown This is an R Markdown document. Markdown is a simple formatting syntax for authoring HTML, PDF, and MS Word documents. For more details on using R Markdown see ht ## Min. : 4.0 Min. : 2.00 ## 1st Qu.:12.0 1st Qu.: 26.00 ## Median :15.0 Median : 36.00 ## Mean :15.4 Mean : 42.98

VISUAL EDITOR

Insert Citations

3rd Qu.:19.0 3rd Qu.: 56.0 ## Max. :25.0 Max. :120.00

Create citations from a bibliography file, a Zotero library, or from DOI references. dink urb-[This is a link.](link url)

Write with Markdown

Plain text.

escaped: * _ \ endash: --, emdash:

Header 1

Header 2

- item 2h

1. ordered list 2. item 2 - item 2a (indent 1 tab)

The syntax on the left renders as the output on the right. Plain text. End a line with two spaces to start a new paragraph. End a line with two spaces to start a new paragraph. Also end with a backslash) Also end with a backslash "italics" and ""bold" italics and bold superscript^2^/subscript~2 superscript2/subscript ~strikethrough~ escaped: *_\

> Header 1 Header 2

Header 6 unordered list item 2 - item 2a (indent 1 tab) - item 2b unordered list

 item 2a (indent 1 tab
 item 2b L. ordered list 2. item 2

endash: -, emdash: -

 item 2a (indent 1 tab)
 item 2b http://www.rstudio.com

This is a link.

th tidyr::cheat sheet

hape Data - Pivot data to reorganize values into a new layout.



intry year type count

1999 pop 19M

2000 pop 20M

1999 pop 172M

2000 cases 80k 2000 pop 174M

1999 cases 212K 1999 pop 1T

C 2000 pop 1T

or with [[and \$.

osetting columns.

A tibble: 3 x 2

pivot_longer(data, cols, names_to = "name", values_to = "value", values_drop_na = FALSE) "Lengthen" data by collapsing several columns into two. Column names move to a new names to column and values to a new values to

pivot_longer(table4a, cols = 2:3, names_to ="year" values_to = "cases")

pivot_wider(data, names_from = "name". values from = "value")

The inverse of pivot_longer(). "Widen" data by expanding two columns into several. One column provides the new column names, the other the

pivot_wider(table2, names_from = type values_from = count)

na.rm = FALSE) Collapse cells across several

unite(table5, century, year, col = "year", sep = "")

Expand **Tables**

Create new combinations of variables or identify implicit missing values (combinations of variables not present in the data).



expand(data, ...) Create a new tibble with all possible combinations of the values of the variables listed in . . . Drop other variables. expand(mtcars, cyl, gear,

complete(data, ..., fill = A 1 3 A 2 NA list()) Add missing possible B 1 4 combinations of values of variables listed in ... Fill remaining variables with NA. complete(mtcars, cyl, gear,

Handle Missing Values

drop_na(data,...) Drop rows containing NA's in ...



fill(data, ..., .direction = "down") Fill in NA's in ... columns using the next or

previous value. fill(x, x2)

> Specify a value to replace NA in selected columns. replace_na(x, list(x2 = 2))

RStudio⁸ is a trademark of RStudio PBC • CC BY SA RStudio • info@rstudio com • 844-448-1212 • rstudio com • Learn more at tidyr.tidyverse.org • tibble 3.1.2 • tidyr.1.1.3 • Updated: 2021-08

Split Cells - Use these functions to split or combine cells into individual, isolated values. he data on one screen. max = n, tibble.print_min = m, Inf) Control default display settings. unite(data, col, ..., sep = "_", remove = TRUE,

2000 2K 20M

B 1999 37K 172M

C 2000 213K 1T



country year rate country year c A 1999 0.7K/19M A 1999 0.7K A 2000 2K/20M A 2000 2K B 2000 80K

A 1999 0.7K A 1999 19M 2000 2K A 2000 20M B 1999 172M B 2000 80K

country year rate country year rate
A 1999 0.7K/19M A 2000 2K/20 B 1999 37K/ B 2000 80K/174M

separate(data, col, into, sep = "[^[:alnum:]]+", remove = TRUE, convert = FALSE, extra = "warn", fill = "warn", ...) Separate each cell in a column into several columns. Also extract().

separate(table3, rate, sep = "/", into = c("cases", "pop"))

columns into a single column.

separate_rows(data, ..., sep = "[^[:alnum:].]+", convert = FALSE) Separate each cell in a column into several rows.

separate rows(table3, rate, sep = "/")

Drop or replace explicit missing values (NA).



replace_na(data, replace)



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both discrete

g <- ggplot(diamonds, aes(c

g + geom_count()

e + geom_jitter(he

seals\$z <- with(seals, sqrt(d

THREE VARIABLES

x, y, alpha, color, fill

x, y, alpha, color, fill

I + geom contour

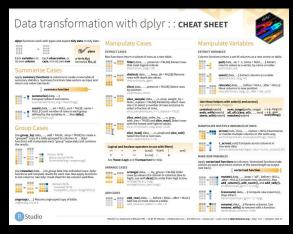
x, y, z, alpha, color,

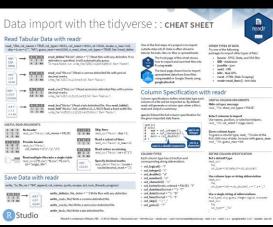
+ geom_contour

x, y, alpha, color, fill

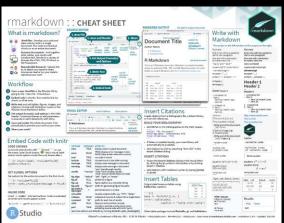
Use Cheatsheets!

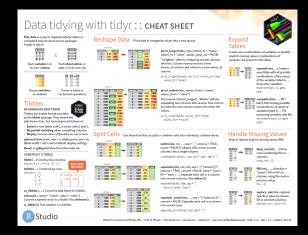
https://www.rstudio.com/resources/cheatsheets/

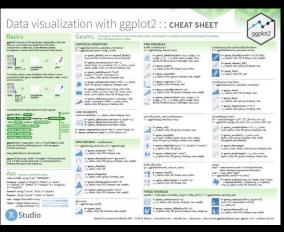












Browse vignettes (if available)

- Can access by the Help page for a package
- Use the `browseVignettes()` function
- Access through CRAN page for the package (e.g. <u>dplyr</u>)

Check out demos (if available)

- Use `demo() ` to list all demos for packages in your library
- `demo(package = .packages(all.available = TRUE))`
 for all available
- Run demo with function and name of the demo

```
demo(lm.glm, package = "stats", ask = TRUE)
```

Searching for Help

- Use `apropos() `function
- `help.search()` or `??`
 - For example: help.search ("date") is also ??"date"

Online Help

- CRAN Help Page
- CRAN FAQ pages
 - Main
 - Windows Users
 - MacOS Users
- Stack Overflow
- Google
- R Email Lists (through your organization or even <u>CRAN</u>)

reprex (reproducible example)

- Your code examples should be:
 - Minimal
 - Complete
 - Reproducible

How to Make a Great R
Reproducible Example
on Stack Overflow is
super informative





Books (my favorites)

- R for Data Science by Hadley Wickham & Garrett Grolemund
- Hands-On Programming with R by Garrett Grolemund
- Advanced R by Hadley Wickham
- What They Forgot to Teach You About R by Jennifer Bryan & Jim Hester
- R Markdown: The Definitive Guide by Yihui Xie, JJ Allaire, & Garrett Grolemund
- ggplot2: Elegant Graphics for Data Analysis by Hadley Wickham, Danielle Navarro, and Thomas Lin Pedersen
- Happy Git and GitHub for the useR by Jennifer Bryan, the STAT 545 TAs, and Jim Hester



Books (cont.)

- ModernDive: Statistical Inference via Data Science by Chester Ismay and Albert Y. Kim
- R Packages by Hadley Wickham and Jennifer Bryan
- Getting used to R, RStudio, and R Markdown by Chester Ismay
- <u>Data Visualization: A Practical Introduction</u> by Kieran Healy
- <u>Fundamentals of Data Visualization</u> by Claus O. Wilke
- <u>Learning Statistics with R</u> by Danielle Navarro

...and a whole bunch more! Visit the <u>RStudio Books</u> page for more!



Online Learning

- RStudio Education (several levels and resources)
- <u>Data Analysis and Visualization in R for Ecologists</u> by Francois Michonneau & Auriel Fournier (through Data Carpentry)
- RStudio.cloud Primers learn by doing
- <u>STAT545: Data wrangling, exploration, and analysis with R</u> by Jennifer Bryan and the STAT 545 TAs for the University of British Columbia

Community and People

- RStudio Community Forums
- R4DS community Be sure to join the slack channel
- ROpenSci
- Tidy Tuesday
- R-Ladies (New Orleans, Gainesville, Orlando, Tampa)
- Twitter #rstats, #r4ds, etc.
- Facebook Groups
- Email listservs

R for the infrequent UseR

ob.select= 1 er ob.select=1 ntext.scene.objects.action "Selected" + str(modified irror ob.select = 0 bpy.context.selected_ob ata.objects[one.name].se int("please select exact)

peration == "MIRROR_X": irror_mod.use_x = True "Irror_mod.use_y = False _operation == "MIRROR_Y" Irror_mod.use_x = False Lrror_mod.use_y = True Mirror_mod.use_z = False operation == "MIRROR Z":

or ject to mirror

OPERATOR CLASSES -Shannon Dunnigan

Guana Tolomato Matanzas NERR

Shannon.Dunnigan@FloridaDEP.gov

x mirror to the selection skdunnigan irror x skdunnigan Pror Xª

. ic not