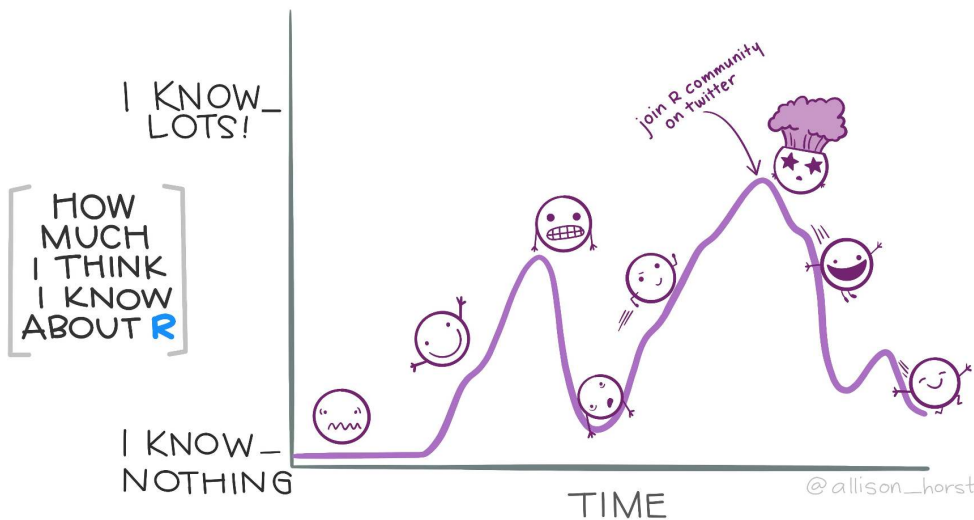


Getting help in R

After this workshop



Steffi LaZerte <https://steffilazerte.ca>



Artwork by [@allison_horst on Twitter](#) -- "Knowing so little never felt so fun. #rstats"

2 / 35

Troubleshooting

Bit by bit

Line by line

- R is sequential
- If you skip lines, you're not running that part

```
#library(tidyverse)
count(mtcars, am)
```

```
## Error in count(mtcars, am): could not find function "count"
```

4 / 35

Bit by bit

Line by line

- R is sequential
- If you skip lines, you're not running that part

```
#library(tidyverse)
count(mtcars, am)
```

```
## Error in count(mtcars, am): could not find function "count"
```

- Error? Start at the beginning and go line by line

```
library(tidyverse)
count(mtcars, am)
```

```
##   am  n
## 1  0 19
## 2  1 13
```

4 / 35

Bit by bit

Line by line

Especially important if loading and modifying data

```
# Load Data
size <- read_csv("./data/grain_size2.csv")

# First modification
size <- mutate(size,
               total_sand = coarse_sand + medium_sand + fine_sand,
               total_silt = coarse_silt + medium_silt + fine_silt)

# Second modification
size <- size %>%
  group_by(plot) %>%
  summarize(n = n(),
            total_sand = sum(total_sand),
            mean_sand = mean(total_sand),
            sd_sand = sd(total_sand),
            se_sand = sd_sand / sqrt(n))
```

Can't run 1st modification
after 2nd modification

5 / 35

Bit by bit

Section by section

```
size <- read_csv("./data/grain_size2.csv") %>%
  mutate(total_sand = coarse_sand + medium_sand + fine_sand,
         total_silt = coarse_silt + medium_silt + fine_silt) %>%
  group_by(plot) %>%
  summarize(n = n(),
           total_sand = sum(total_sand),
           mean_sand = mean(total_sand),
           sd_sand = sd(total_sand),
           se_sand = sd_sand / sqrt(n))
```

```
## Error: Problem with `summarise()` input `mean_sand`.
## x object 'total_sand' not found
## i Input `mean_sand` is `mean(total_sand)`.
## i The error occurred in group 1: plot = "CSP01".
```

6 / 35

Bit by bit

Section by section

```
size <- read_csv("./data/grain_size2.csv")
```

No error

7 / 35

Bit by bit

Section by section

```
size <- read_csv("./data/grain_size2.csv")
```

No error

```
size <- read_csv("./data/grain_size2.csv") %>%
  mutate(total_sand = coarse_sand + medium_sand + fine_sand,
         total_silt = coarse_silt + medium_silt + fine_silt)
```

No error

7 / 35

Bit by bit

Section by section

```
size <- read_csv("./data/grain_size2.csv")
```

No error

```
size <- read_csv("./data/grain_size2.csv") %>%  
  mutate(total_sand = coarse_sand + medium_sand + fine_sand,  
         total_silt = coarse_silt + medium_silt + fine_silt)
```

No error

```
size <- read_csv("./data/grain_size2.csv") %>%  
  mutate(total_sand = coarse_sand + medium_sand + fine_sand,  
         total_silt = coarse_silt + medium_silt + fine_silt) %>%  
  group_by(plot)
```

No error

7 / 35

Bit by bit

Section by section

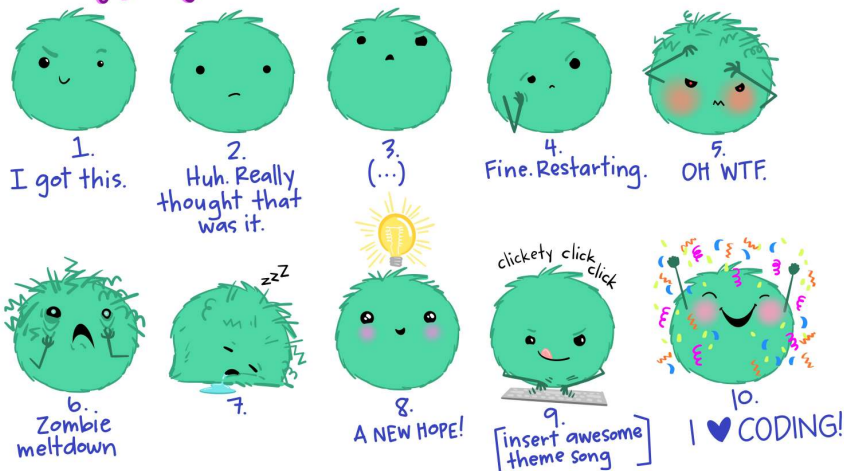
```
size <- read_csv("./data/grain_size2.csv") %>%  
  mutate(total_sand = coarse_sand + medium_sand + fine_sand,  
         total_silt = coarse_silt + medium_silt + fine_silt) %>%  
  group_by(plot) %>%  
  summarize(n = n(),  
           total_sand = sum(total_sand),  
           mean_sand = mean(total_sand),  
           sd_sand = sd(total_sand),  
           se_sand = sd_sand / sqrt(n))
```

```
## Error: Problem with `summarise()` input `mean_sand`.  
## x object 'total_sand' not found  
## i Input `mean_sand` is `mean(total_sand)`.  
## i The error occurred in group 1: plot = "CSP01".
```

Ah ha!

8 / 35

debugging



Artwork by @allison_horst

@allison_horst 9 / 35

R is never wrong

R is never wrong

Just sometimes unhelpful!

Getting Help

Vignettes

Many packages come with vignettes (aka, R tutorials)

List Vignettes

```
vignette(package = "ggplot2")
```

Vignettes in package 'ggplot2':

ggplot2-specs	Aesthetic specifications (source, html)
extending-ggplot2	Extending ggplot2 (source, html)
profiling	Profiling Performance (source, html)

Load Vignettes

```
vignette("ggplot2-specs", package = "ggplot2")
```

Try it!

14 / 35

Tutorials

Vignettes also online

- e.g., [tidyverse](#)

Organizations/Websites

- [Software Carpentry](#)
- [STHDA](#)

The screenshot shows the ggplot2 website. At the top, it says 'ggplot2 3.2.1 part of the tidyverse'. There are navigation links: Reference, Articles, News, Extensions, and a search icon. The main content is divided into two columns. The left column has an 'Overview' section with a paragraph about ggplot2 being a system for declaratively creating graphics, and an 'Installation' section with a code block showing how to install the whole tidyverse, just ggplot2, or the development version from GitHub. The right column has a 'Links' section with links to download from CRAN, browse source code, report a bug, learn more, extensions, and license.

ggplot2 3.2.1 part of the tidyverse

Reference Articles News Extensions

Overview

ggplot2 is a system for declaratively creating graphics, based on [The Grammar of Graphics](#). You provide the data, tell ggplot2 how to map variables to aesthetics, what graphical primitives to use, and it takes care of the details.

Installation

```
# The easiest way to get ggplot2 is to install the whole tidyverse:
install.packages("tidyverse")

# Alternatively, install just ggplot2:
install.packages("ggplot2")

# Or the the development version from GitHub:
# install.packages("devtools")
devtools::install_github("tidyverse/ggplot2")
```

Links

Download from CRAN at <https://cloud.r-project.org/package=ggplot2>

Browse source code at <https://github.com/tidyverse/ggplot2>

Report a bug at <https://github.com/tidyverse/ggplot2/issues>

Learn more at <http://r4ds.had.co.nz/data-visualisation.html>

Extensions at <http://www.ggplot2-exts.org/gallery/>

License
GPL-2 | file LICENSE

ggplot2 website

15 / 35

Books!

Free Online

- [R for Data Science](#) (read it!)
- [R Graphics Cookbook](#) (how to do X)
- [ggplot2](#) (next level)
- [Data Visualization: A practical introduction](#)
- [Geocomputation with R](#) (spatial, GIS, maps)
- [Statistical Inference via Data Science: A ModernDive into R and the tidyverse](#) (stats)

16 / 35

Specific help

Examples

In R

```
?geom_boxplot
```

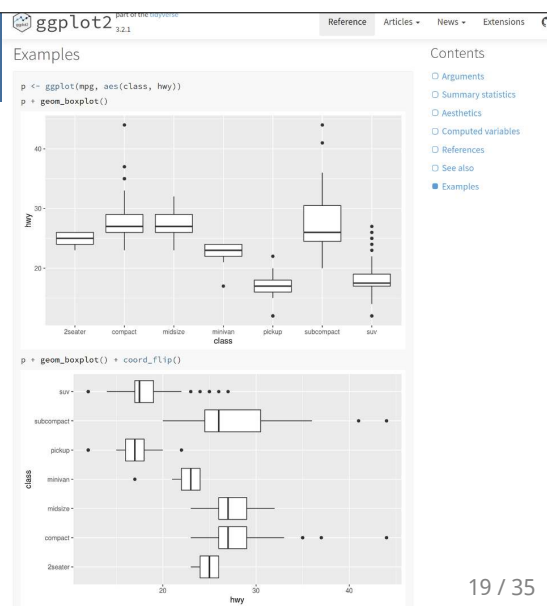
Copy and paste the examples into your console

18 / 35

Examples

On the web

- Nice to see expected output
- Helps figure out if it's your system or your code



19 / 35

Web searches

- Always include "R" in the search
- Include the package name!
- Use keywords
- Some errors are very general

20 / 35

Web searches

- Always include "R" in the search
- Include the package name!
 - Try "R boxplots" vs. "R boxplots ggplot2"
- Use keywords
 - Try "R boxplots ggplot2 notch"
- Some errors are very general
 - Try "R Error: object 'm' not found"

21 / 35

Stackoverflow etc.

"R how to remove duplicate rows"

Stackoverflow etc.

Things to consider

- Date (i.e., R version, Package Version)
- Packages used (**tidyverse**? R base? A mix?)
- What are the example data?
 - **mtcars** and **iris** are commonly used data sets built into R base
 - **msleep** and **diamonds** are commonly used data sets built into **ggplot2**
- What are the example columns?
- What is actually required to answer *your* question?

23 / 35

Asking for Help

Not useful

- "I got an error"
- "It didn't work"

24 / 35

Asking for Help

Not useful

- "I got an error"
- "It didn't work"

Better!

- "I got *this* error"
- "It didn't give me *this*"

24 / 35

Asking for Help

Not useful

- "I got an error"
- "It didn't work"

Better!

- "I got *this* error"
- "It didn't give me *this*"

Best!!

- "I did *this* and I got *this* error"
- "I expected it to do *this*, but in fact the output was *this*"

24 / 35

Asking for Help

Not useful

- "I got an error"
- "It didn't work"

Better!

- "I got *this* error"
- "It didn't give me *this*"

Best!!

- "I did *this* and I got *this* error"
- "I expected it to do *this*, but in fact the output was *this*"

Best of the Best!!!

- "I did *this* [small reproducible code, including data set] and I got *this* [exact error/output]"

24 / 35

Reproducible Examples

- Minimal code and data required to reproduce the error
- Often preparing this actually helps you solve the error!
- Includes
 - packages (**library()**)
 - data
 - runnable code

25 / 35

Reproducible Examples

How do I change the order of **vore**?

Not reproducible

```
ggplot(data = m, aes(x = vore, y = awake, fill = `Body Size`)) +  
  theme_bw() +  
  theme(axis.title.x = element_blank()) +  
  geom_boxplot() +  
  scale_fill_viridis_d() +  
  labs(y = "Awake time (hrs)",  
       title = "Awake time by Diet")
```

```
## Error in ggplot(data = m, aes(x = vore, y = awake, fill = `Body Size`)): could not find function  
"ggplot"
```

- No indication of packages
- No indication of what **m** is

26 / 35

Reproducible Examples

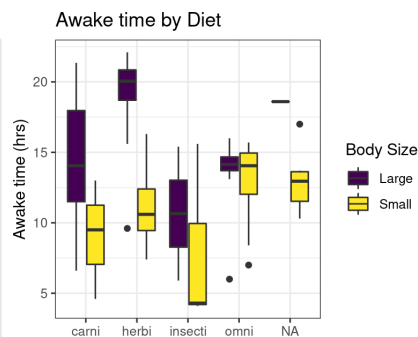
How do I change the order of **vore**?

Reproducible, but not minimal

```
library(ggplot2)
```

```
m <- msleep %>%  
  mutate(`Body Size` = if_else(bodywt > median(bodywt),  
                                "Large", "Small"))
```

```
ggplot(m, aes(x = vore, y = awake, fill = `Body Size`)) +  
  theme_bw() +  
  theme(axis.title.x = element_blank()) +  
  geom_boxplot() +  
  scale_fill_viridis_d() +  
  labs(y = "Awake time (hrs)",  
       title = "Awake time by Diet")
```



27 / 35

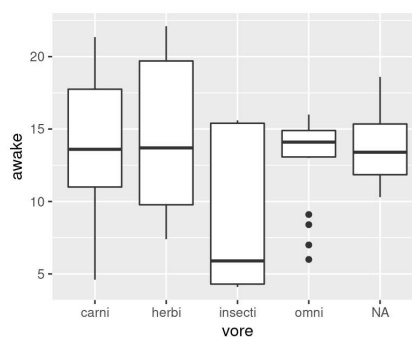
Reproducible Examples

How do I change the order of **vore**?

Reproducible AND Minimal

```
library(ggplot2)
```

```
ggplot(msleep, aes(x = vore, y = awake)) +  
  geom_boxplot()
```



28 / 35

Talking about Reproducibility...

Citing Software

In-line Text

- Software name
- Version
- Programmers/authors OR Journal article releasing the software (if available)

Bibliography

- Journal article releasing the program **OR**
- Programmers/authors
- Year of release
- Program Name
- URL

30 / 35

Citing R

Inline

"All statistical analyses were performed with R statistical software (v3.6.2, R Core Team 2019)."

Bibliography

R Core Team (2019). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL <https://www.R-project.org/>.

31 / 35

Citing R

Version information

```
R.Version()$version.string
```

```
## [1] "R version 4.0.3 (2020-10-10)"
```

Citation information

```
citation()
```

```
##  
## To cite R in publications use:  
##  
## R Core Team (2020). R: A language and environment for statistical  
## computing. R Foundation for Statistical Computing, Vienna, Austria.  
## URL https://www.R-project.org/.
```

32 / 35

Citing R Packages

Inline

"All statistical analyses were performed with R statistical software (v4.0.3, R Core Team 2020). We performed Type III ANOVAs using the 'car' package for R (v3.0.10, Fox and Weisberg)."

Bibliography

John Fox and Sanford Weisberg (2019). An R Companion to Applied Regression, Third Edition. Thousand Oaks CA: Sage.

33 / 35

Citing R Packages

Version information

```
packageVersion("car")
```

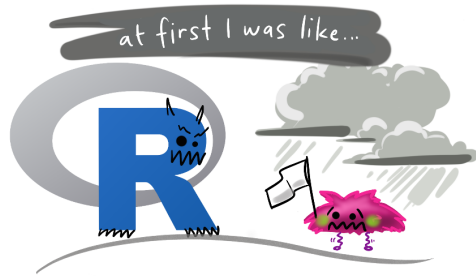
```
## [1] '3.0.10'
```

Citation information

```
citation("car")
```

```
##  
## To cite the car package in publications use:  
##  
## John Fox and Sanford Weisberg (2019). An {R} Companion to Applied  
## Regression, Third Edition. Thousand Oaks CA: Sage. URL:  
## https://socialsciences.mcmaster.ca/jfox/Books/Companion/
```

34 / 35



You made it!

Thank you!



Artwork by [@allison_horst](#)

35 / 35