



# BIENVENIDOS

## Introduction to R programing.

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Faisalabad, November 2023



@BiovIntCIAT\_eng  
@BiovIntCIAT\_esp

#Alliance4Science

The Alliance of Bioversity International and the International Center for Tropical Agriculture (CIAT) is part of CGIAR, a global research partnership for a food-secure future



# Github account: Ifdelgadom

Lfdelgadom

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hyperblog Public

This is the project used in Git and GitHub course of PLATZI

HTML

Cassava2050/PPD Public

Data analysis of 8-year study of PPD in cassava.

R

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Luis Fernando

lfdelgadom

Data analyst | Professor | R | SQL | Python | Mix modelling | Experimental design | data science

Contribution activity

<https://github.com/lfdelgadom>

# Day\_1 training

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main ▾ 1 branch 0 tags Go to file Add file ▾ <> Code ▾

Delgado Munoz and Delgado Munoz Merge branch 'main' of http://... 3cd58ba 15 minutes ago 3 commits

	data	initial commit	22 minutes ago
	images	initial commit	22 minutes ago
	output	initial commit	22 minutes ago
	.gitignore	initial commit	22 minutes ago
	CIP_dictionary.Rmd	initial commit	22 minutes ago
	README.md	Initial commit	24 minutes ago
	R_graphics.R	initial commit	22 minutes ago

About 

Day\_1 practical sessions of the Regional training course in Experimental Design for the advancement of mutant populations.

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Releases

# R is an open-source programing language.

- R is a programing language focused on computational statistics (R project).



Ross Ihaka  
(New Zealand Statistician)



Robert Gentleman  
(Canadian Statistician)

# Download R from CRAN



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## The Comprehensive R Archive Network

### Download and Install R

Precompiled binary distributions of the base system and contributed packages, **Windows and Mac** users most likely want one of these versions of R:

- [Download R for Linux \(Debian, Fedora/Redhat, Ubuntu\)](#)
- [Download R for macOS](#)
- [Download R for Windows](#)

R is part of many Linux distributions, you should check with your Linux package management system in addition to the link above.

### Source Code for all Platforms

Windows and Mac users most likely want to download the precompiled binaries listed in the upper box, not the source code. The sources have to be compiled before you can use them. If you do not know what this means, you probably do not want to do it!

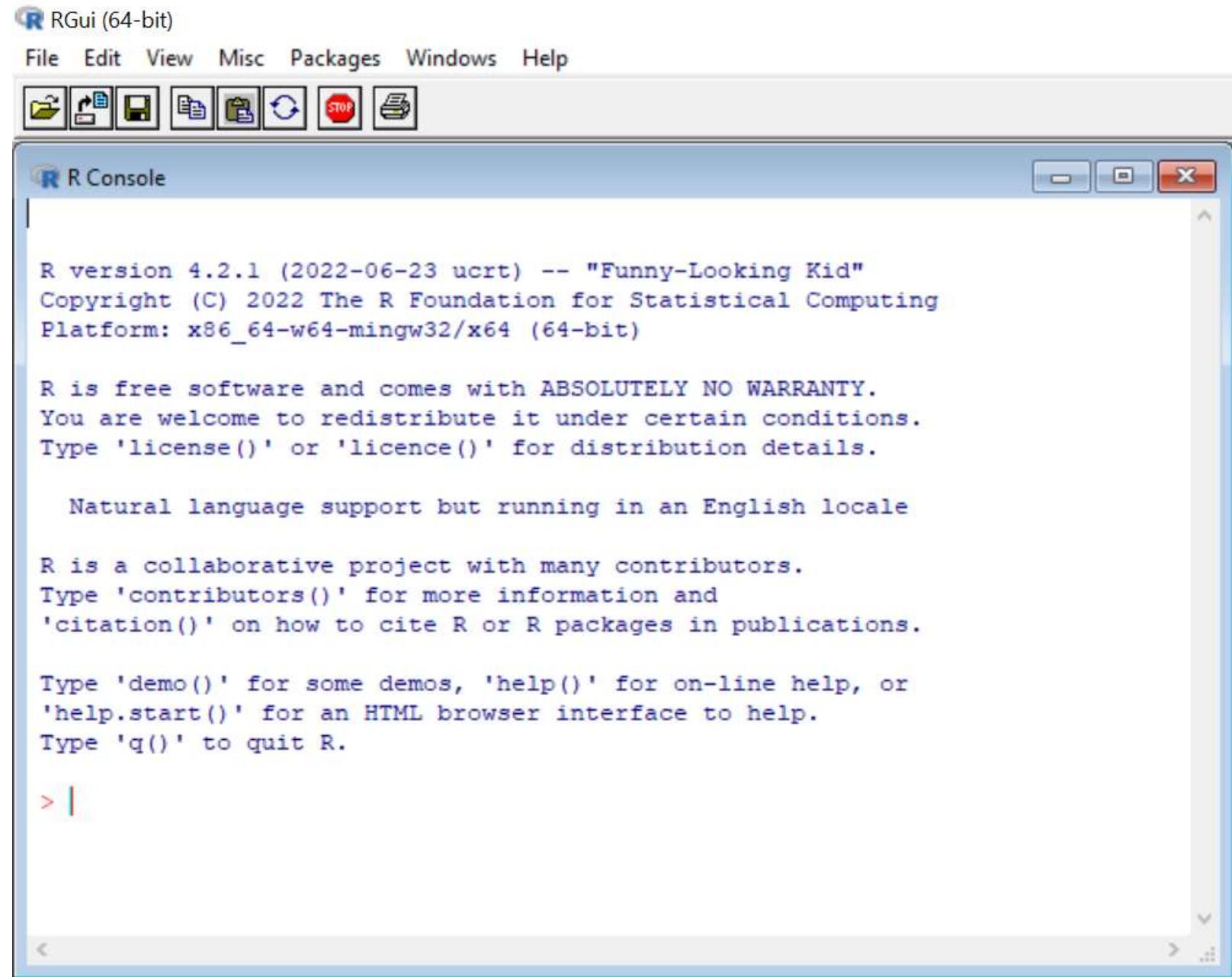
- The latest release (2022-06-23, Funny-Looking Kid) [R-4.2.1.tar.gz](#), read [what's new](#) in the latest version.
- Sources of [R alpha and beta releases](#) (daily snapshots, created only in time periods before a planned release).
- Daily snapshots of current patched and development versions are [available here](#). Please read about [new features and bug fixes](#) before filing corresponding feature requests or bug reports.
- Source code of older versions of R is [available here](#).
- Contributed extension [packages](#)

### Questions About R

- If you have questions about R like how to download and install the software, or what the license terms are, please read our [answers to frequently asked questions](#) before you send an email.

# R console

- R version
- R name
- R licence
- prompt >



# Never Save R "Workspace Image":

## Using R: Don't save your workspace

Posted on April 2, 2017 by mrtnj in R bloggers | 0 Comments

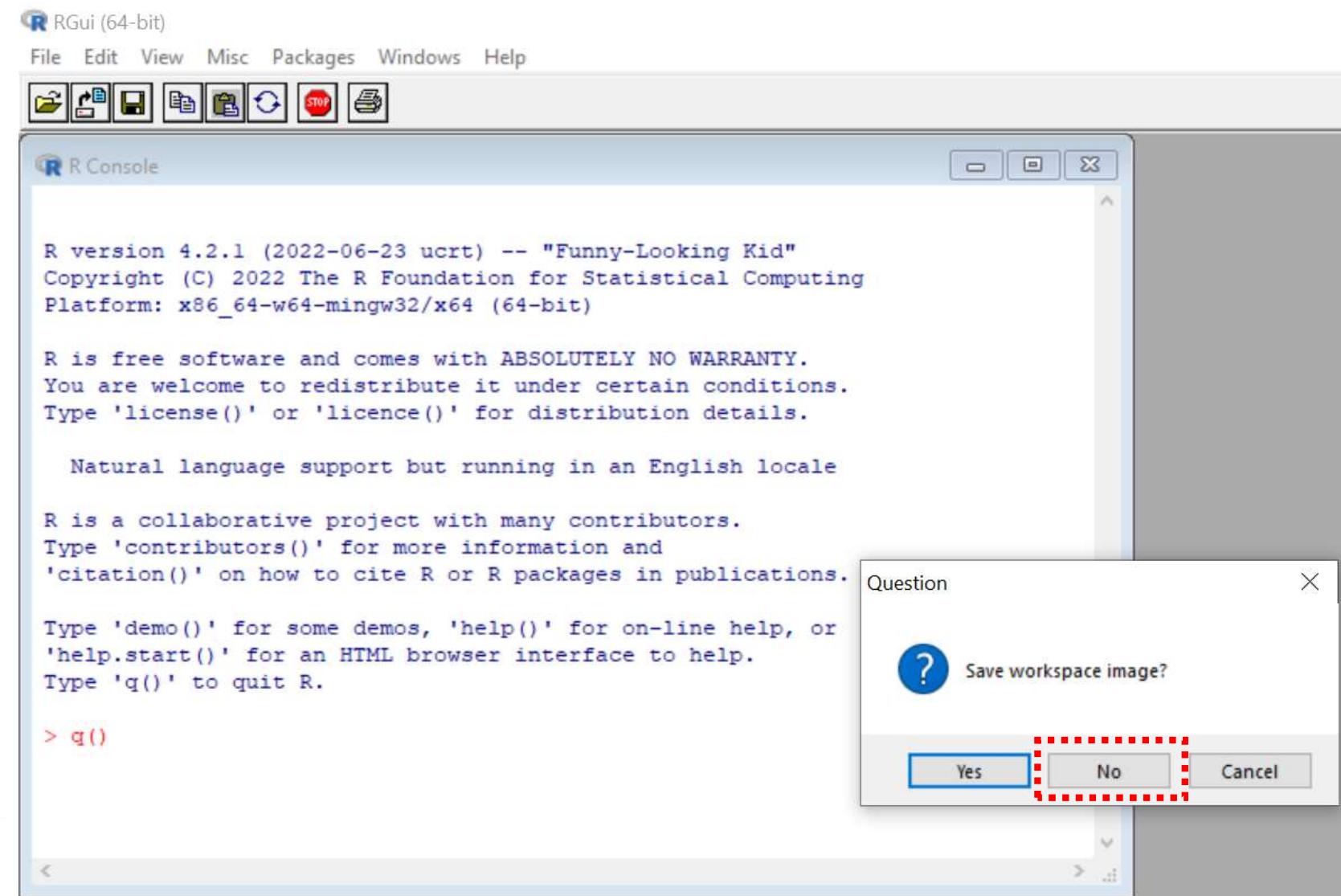
[This article was first published on [R - On unicorns and genes](#), and kindly contributed to R-bloggers].  
(You can report issue about the content on this page [here](#))

Want to share your content on R-bloggers? [click here](#) if you have a blog, or [here](#) if you don't.

[Share](#)  [Tweet](#)

To everyone learning R: Don't save your workspace.

When you exit an R session, you're faced with the question of whether or not to save your workspace. You should almost never answer yes. Saving your workspace creates an image of your current variables and functions, and saves them to a file called ".RData". When you re-open R from that working directory, the workspace will be loaded, and all these things will be available to you again. But you don't want that, so don't save your workspace.



Source

# R as calculator

```
1
```

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

# R as calculator

```
1  
1 + 1
```

```
## [1] 1  
## [1] 2
```

# R as calculator

```
1  
1 + 1  
34 / 40
```

```
## [1] 1  
## [1] 2  
## [1] 0.85
```

# R as calculator

```
1  
1 + 1  
34 / 40  
5 < 4
```

```
## [1] 1  
## [1] 2  
## [1] 0.85  
## [1] FALSE
```

# R as calculator

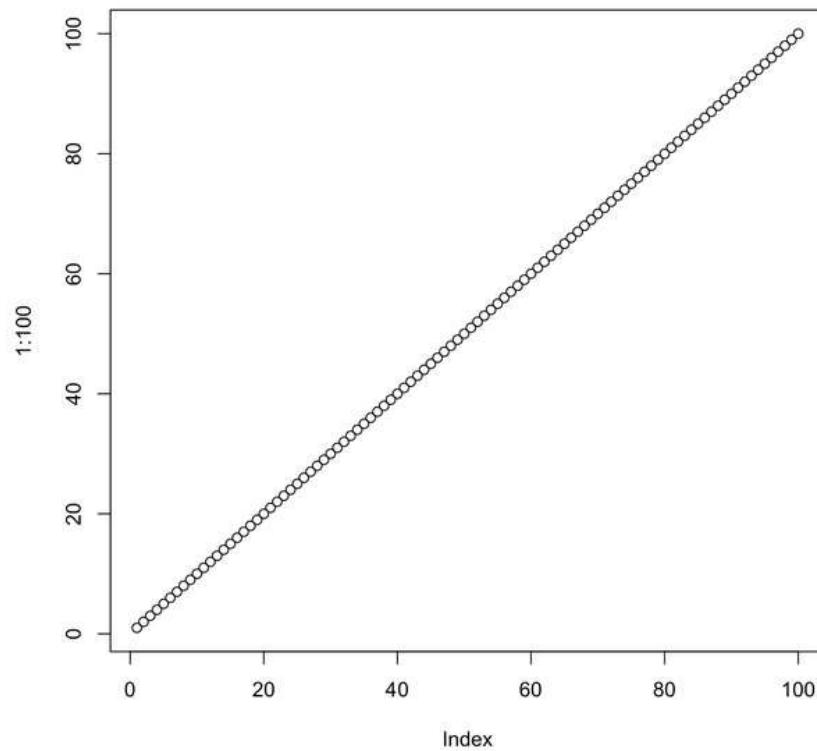
```
1  
1 + 1  
34 / 40  
5 < 4  
16 == 16
```

```
## [1] 1  
## [1] 2  
## [1] 0.85  
## [1] FALSE  
## [1] TRUE
```

# Plot function

Code      Output

```
plot(1:100)
```





# R functions

In a programming environment, a function is a set of instructions. A programmer constructs a function to avoid repeating the same task or to reduce the complexity of the task.

---

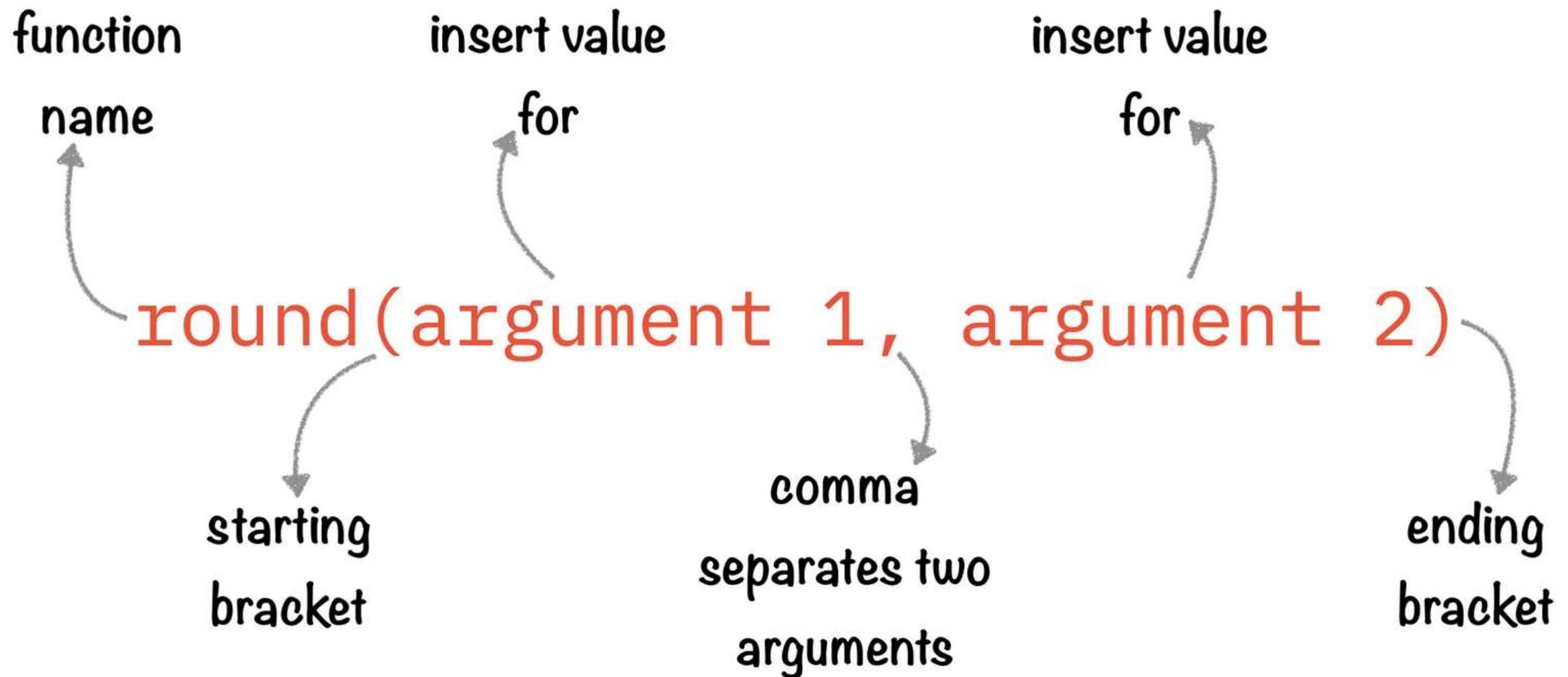
Code      Output

---

```
round(9.1565, 2)
```

```
## [1] 9.16
```

# R function structure



# Round function

---

Code      Output

```
round(x = 564.56743, digits = 2)  
## [1] 564.57
```

# Square root function

---

Code      Output

---

```
sqrt(x = 9)
```

```
## [1] 3
```

# Seq function

---

Code      Output

```
seq.int(from = 10, to = 30, by = 5)  
## [1] 10 15 20 25 30
```



# R comments

- Humans can read the comments, but our computer will skip over them.
- # is used as a comment symbol before starting to write.



# How to write a comment?

---

Code      Output

---

```
# secret code of happiness  
(1 + 4) - (3 * 5) / 10  
## r does not evaluate this  
# all these are comments  
# comments are very important  
## [1] 3.5
```

# **So far everything is going well, but in addition..**

- R can combine plots, tables, and images in a single file` (R markdown).
- Publish our document work to the Internet and turn it into .word, .pdf and .html file types.
- Work in an efficient way by putting together different projects, saving them, and keeping track of them (git in R).

For all of the above, we need .....





Studio<sup>®</sup>

# R Studio

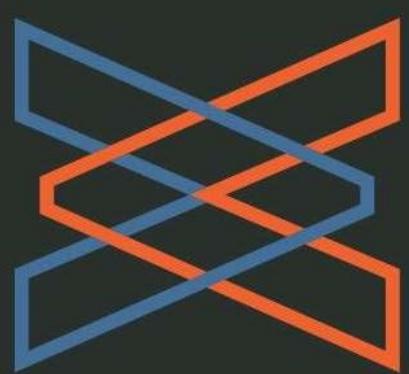
- 2009, Joseph J. Allaire own RStudio.
- In 2011, RStudio IDE was released to R.
- "RStudio is used as open source software focused on data science" (16 Jan 2022)



Joseph J. Allaire

# RStudio became Posit

Oct, 2022



posit™

# R & R Studio

R: Engine



RStudio: Dashboard



<https://www.rstudio.com/products/rstudio/download/#download>

## 1: Install R

RStudio requires R 3.3.0+. Choose a version of R that matches your computer's operating system.

[DOWNLOAD AND INSTALL R](#)

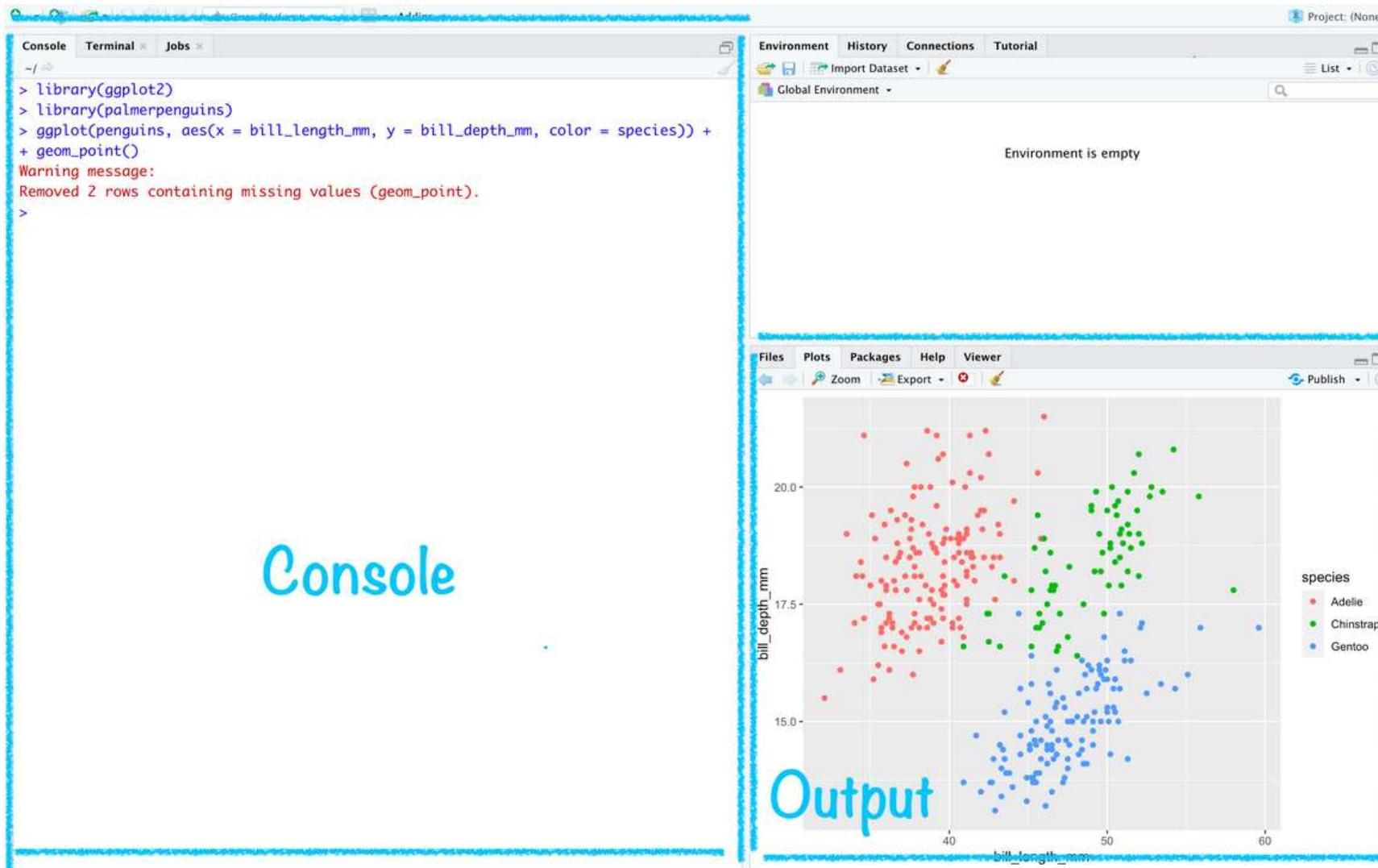
## 2: Install RStudio

[DOWNLOAD RSTUDIO DESKTOP FOR WINDOWS](#)

Size: 214.34 MB | [SHA-256: FE62B784](#) | Version: 2023.09.1+494 | Released: 2023-10-17

[All Installers and Tarballs](#)

# R Studio (IDE: integrated development environment)



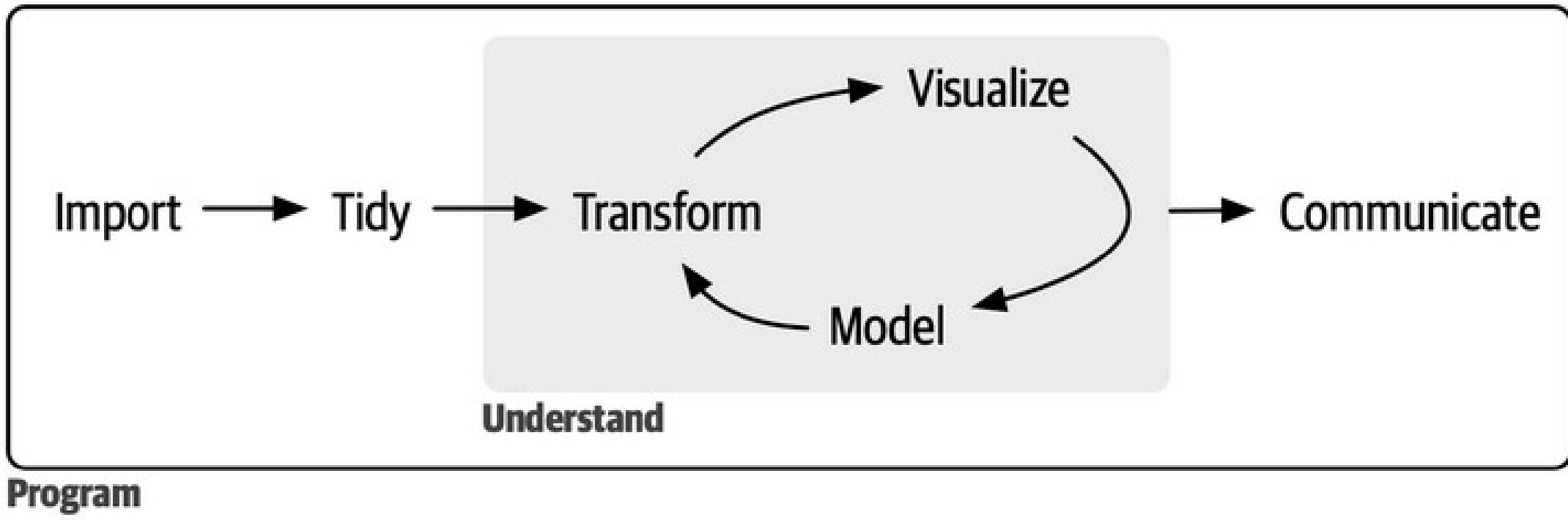
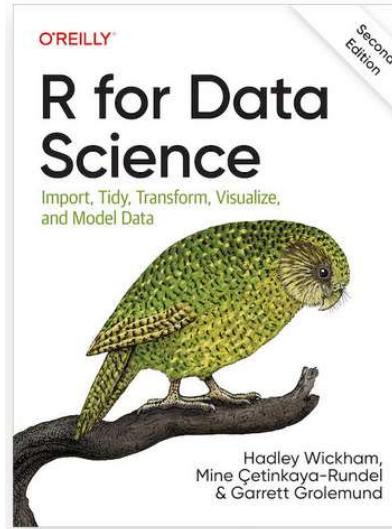
## We all want to learn.



No one is born a data scientist. Every person who works with R today was once a complete beginner. No matter how much you know about the R ecosystem already, you'll always have more to learn.

At RStudio, we know that everyone is at a different stage in learning the vast ecosystem of R, ranging from rank beginner to seasoned data scientists to professional educators. Choose a starting point below, or catch up with us on our [blog](#).

# R for data science



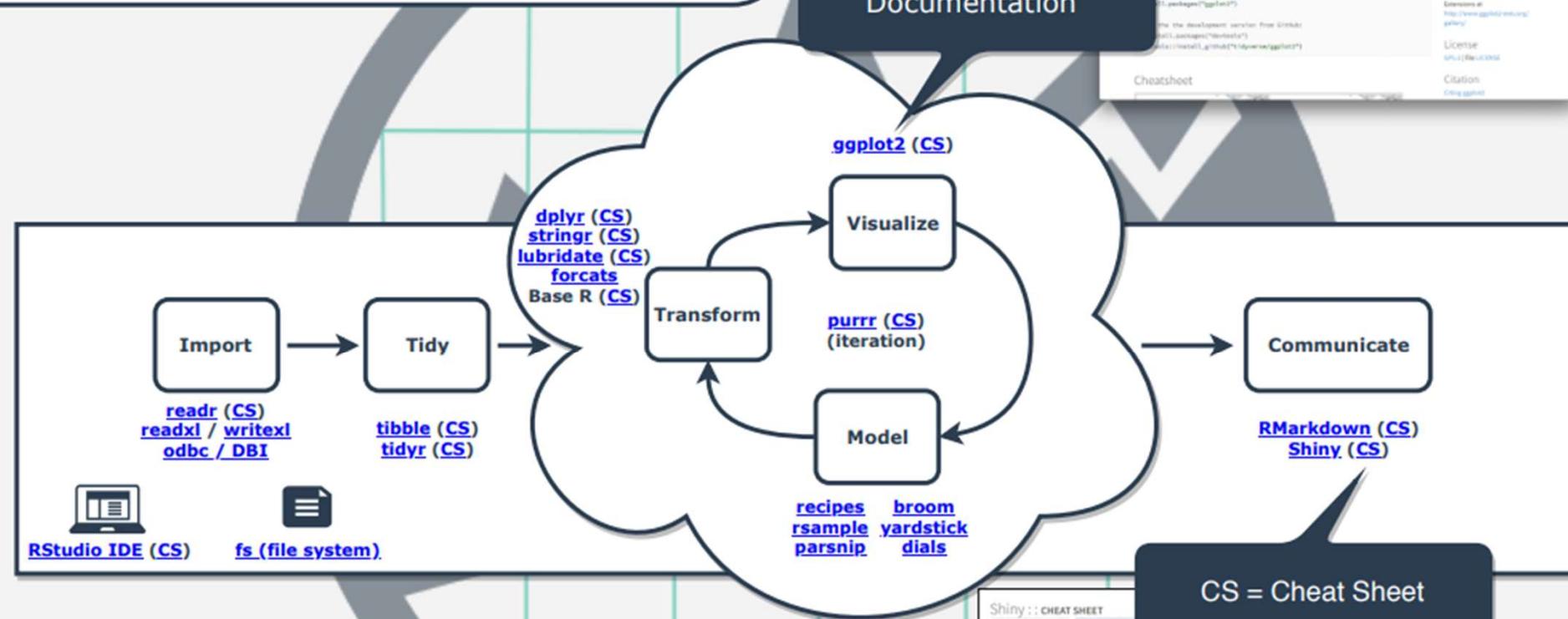
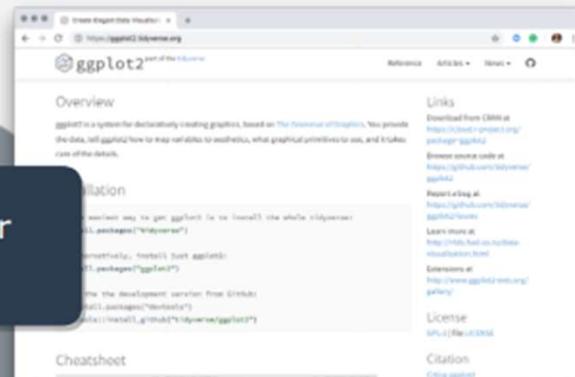
R for data science

# Data Science with R Workflow

The Data Science With R Workflow is available in the book: [R For Data Science](#). If you want to learn R and this workflow *for business*, take the [R For Business Analysis \(DS4B 101-R\) course](#) through Business Science University.



Click the links for Documentation



CS = Cheat Sheet

## Important Resources

- R For Data Science Book: <http://r4ds.had.co.nz/>
- Rmarkdown Book: <https://bookdown.org/yihui/rmarkdown/>
- Data Visualization Book: <https://rkabacoff.github.io/datavis/>
- More Cheatsheets: <https://www.rstudio.com/resources/cheatsheets/>
- tidyverse packages: <https://www.tidyverse.org/>
- Connecting to databases: <https://db.rstudio.com/>
- RMarkdown website: <https://rmarkdown.rstudio.com/>
- Shiny web applications website: <http://shiny.rstudio.com/>
- Jenny Bryan's purrr tutorial: <https://jennybryan.org/>

Fuente:

"Business Science University:  
Enterprise-Grade Data Science Education"



Business Science University  
[university.business-science.io](http://university.business-science.io)

# R packages



# R packages

- Today, 16 November there are 2026 R packages available on [CRAN](#)
- “An R package is a collection of functions, data, and associated documentation. Using packages is the key to successful R programming.
- Most downloaded packages rank in the world. [Source](#)

# To download packages

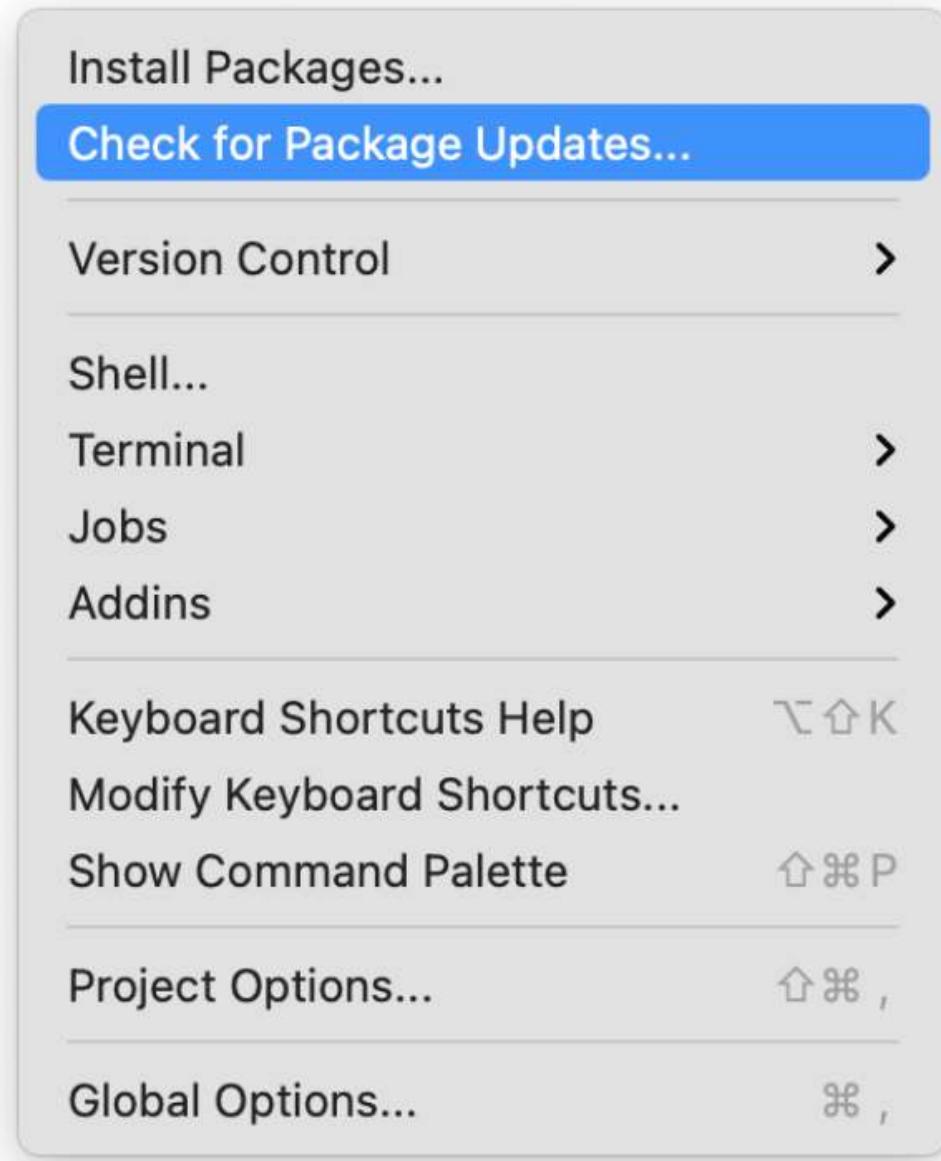
```
install.packages("tidyverse")
```

# To call libraries

```
library(tidyverse)
```

# Takeways

- Install the packages just once .
- In each R document, it is necessary to "call" it once with the library() function, for example: library(ggplot2)
- After a while, it will be necessary to update the installed packages.
- When R is uninstalled, all packages are removed.



Update Packages

	Package	Installed	Available	NEWS
<input type="checkbox"/>	farver	2.0.3	2.1.0	
<input type="checkbox"/>	gifski	0.8.6	0.8.7	
<input type="checkbox"/>	Hmisc	4.4-2	4.5-0	
<input type="checkbox"/>	mathjaxr	1.2-0	1.4-0	
<input type="checkbox"/>	MatrixModels	0.4-1	0.5-0	
<input type="checkbox"/>	ps	1.5.0	1.6.0	
<input type="checkbox"/>	ragg	1.1.0	1.1.1	
<input type="checkbox"/>	rio	0.5.16	0.5.26	
<input type="checkbox"/>	tibble	3.0.6	3.1.0	
<input type="checkbox"/>	tiff	0.1-6	0.1-7	

**Select All** **Select None** **Install Updates** **Cancel**

Update Packages

Package	Installed	Available	NEWS
<input checked="" type="checkbox"/> farver	2.0.3	2.1.0	
<input checked="" type="checkbox"/> gifski	0.8.6	0.8.7	
<input checked="" type="checkbox"/> Hmisc	4.4-2	4.5-0	
<input checked="" type="checkbox"/> mathjaxr	1.2-0	1.4-0	
<input checked="" type="checkbox"/> MatrixModels	0.4-1	0.5-0	
<input checked="" type="checkbox"/> ps	1.5.0	1.6.0	
<input checked="" type="checkbox"/> ragg	1.1.0	1.1.1	
<input checked="" type="checkbox"/> rio	0.5.16	0.5.26	
<input checked="" type="checkbox"/> tibble	3.0.6	3.1.0	
<input checked="" type="checkbox"/> tiff	0.1-6	0.1-7	

Files Plots Packages Help Viewer

Install Update

Name	Description	Version
<b>System Library</b>		
<input type="checkbox"/> abind	Combine Multidimensional Arrays	1.4-5
<input type="checkbox"/> afex	Analysis of Factorial Experiments	0.28-1
<input type="checkbox"/> airports	Data on Airports	0.1.0
<input type="checkbox"/> amap	Another Multidimensional Analysis Package	0.8-18
<input type="checkbox"/> AsioHeaders	'Asio' C++ Header Files	1.16.1-1
<input type="checkbox"/> askpass	Safe Password Entry for R, Git, and SSH	1.1
<input type="checkbox"/> assertthat	Easy Pre and Post Assertions	0.2.1
<input type="checkbox"/> av	Working with Audio and Video in R	0.5.1
<input type="checkbox"/> babynames	US Baby Names 1880–2017	1.0.0
<input type="checkbox"/> backports	Reimplementations of Functions Introduced Since R-3.0.0	1.2.1
<input checked="" type="checkbox"/> base	The R Base Package	4.0.2
<input type="checkbox"/> base64enc	Tools for base64 encoding	0.1-3
<input type="checkbox"/> BayesFactor	Computation of Bayes Factors for Common Designs	0.9.12-4.2
<input type="checkbox"/> bayestestR	Understand and Describe Bayesian Models and Posterior Distributions	0.8.2
<input type="checkbox"/> bbmle	Tools for General Maximum Likelihood Estimation	1.0.23.1
<input type="checkbox"/> BDgraph	Bayesian Structure Learning in Graphical Models using Birth-Death MCMC	2.63
<input type="checkbox"/> bdsmatrix	Routines for Block Diagonal Symmetric Matrices	1.3-4

# Objects in R

# Object creation

```
salary <- c(20, 30, 40, 50, -10)
```

```
salary
```

```
## [1] 20 30 40 50 -10
```

# Object creation

```
name <- c("Ram", "Rani", "Ali", "Preeti", "John")
name

## [1] "Ram"      "Rani"     "Ali"      "Preeti"
## [5] "John"
```

# Object creation

```
place <- c("ny", "ber", "dhl", "tko", "lon")
place
## [1] "ny"   "ber"  "dhl"  "tko"  "lon"
```



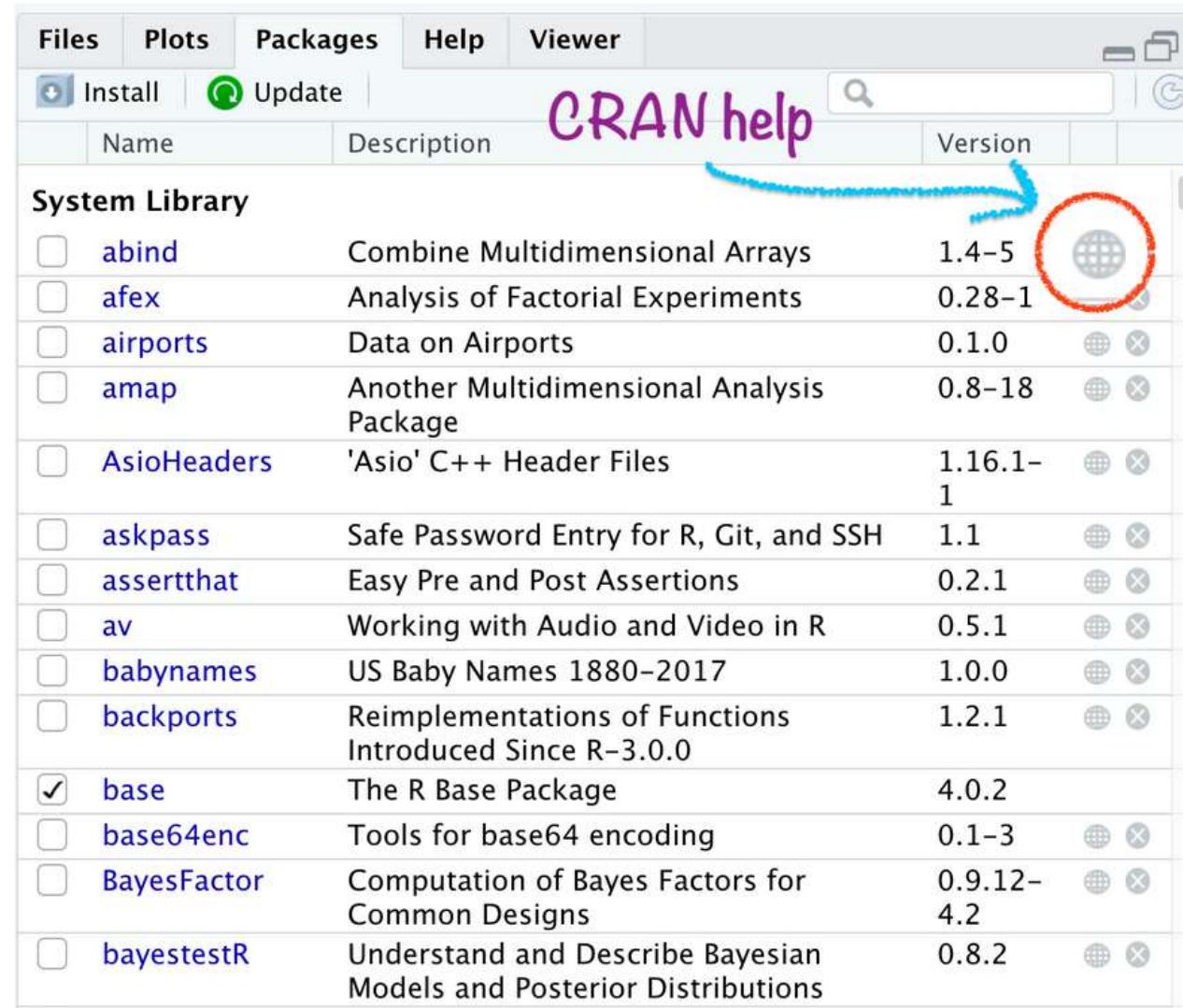
Help!!!

# Using Console >

in console type ?your query

for example ?ggplot

# RStudio: pkg Help Docs



The screenshot shows the RStudio interface with the "Packages" tab selected. A search bar at the top contains the text "CRAN help". A blue arrow points from the word "CRAN" in the search bar to a red circle around a globe icon in the package list. The list is titled "System Library" and includes packages like abind, afex, airports, amap, AsioHeaders, askpass, assertthat, av, babynames, backports, base, base64enc, BayesFactor, and bayestestR. The "base" package is checked.

Name	Description	Version	Actions
<b>System Library</b>			
<input type="checkbox"/> abind	Combine Multidimensional Arrays	1.4-5	
<input type="checkbox"/> afex	Analysis of Factorial Experiments	0.28-1	
<input type="checkbox"/> airports	Data on Airports	0.1.0	
<input type="checkbox"/> amap	Another Multidimensional Analysis Package	0.8-18	
<input type="checkbox"/> AsioHeaders	'Asio' C++ Header Files	1.16.1-1	
<input type="checkbox"/> askpass	Safe Password Entry for R, Git, and SSH	1.1	
<input type="checkbox"/> assertthat	Easy Pre and Post Assertions	0.2.1	
<input type="checkbox"/> av	Working with Audio and Video in R	0.5.1	
<input type="checkbox"/> babynames	US Baby Names 1880-2017	1.0.0	
<input type="checkbox"/> backports	Reimplementations of Functions Introduced Since R-3.0.0	1.2.1	
<input checked="" type="checkbox"/> base	The R Base Package	4.0.2	
<input type="checkbox"/> base64enc	Tools for base64 encoding	0.1-3	
<input type="checkbox"/> BayesFactor	Computation of Bayes Factors for Common Designs	0.9.12-4.2	
<input type="checkbox"/> bayestestR	Understand and Describe Bayesian Models and Posterior Distributions	0.8.2	

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<a href="#">□ Problem in predict.fregre.fd function: could not find function "is.na.fdata"</a> • General		3	34	16m
<a href="#">□ Shiny performing long-running calculations</a>		11	90	31m
<a href="#">□ Help please new to R</a> • General		5	75	1h
<a href="#">🔒 □ Desperate for help! Adding count to bins using gghistogram()</a> •		0	20	1h
<a href="#">□ MosaicMiss option</a> • General		0	31	2h
<a href="#">□ Hi , can any one help me out from this issue when i try to save the file in Rstudio it will save in .R format but when i try to open in folder where it as saved. it is saved in PDF format i want to save the file in .R format only please help me</a> • RStudio IDE		0	13	2h
<small>last visit</small>				
<a href="#">□ Summing columns for habitat selection test</a> • General		3	55	3h
<a href="#">☒ Try Catch R SHiny show modal does not pop up</a> • shiny		1	31	3h

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# Plotting several jpeg images in a single display

[Ask Question](#)

Asked 10 years, 2 months ago Active 10 years, 2 months ago Viewed 10k times

I need to plot and display several jpeg images in a single combined display (or canvas?). For example, suppose I have images {a,b,c,d}.jpg, each of different size, and I would like to plot them on one page in a 2x2 grid. It would be also nice to be able to set a title for each subplot.

7

I've been thoroughly looking for a solution, but couldn't find out how to do it, so any ideas would really help. I would preferably use a solution that is based on the EBImage package.

1

[image](#) [r](#) [plot](#)[share](#) [improve this question](#) [follow](#)

asked Sep 8 '10 at 13:16

 user442446  
979 ● 2 ● 10 ● 13

Thanks for the answers. The real problem was handling image data, with the rimage package I got the image data from the EBImage package to display better. I still get terribly large margins when organizing the plots with the `mfrow()` parameter, although I've played a lot with the `oma` and `mar` parameters. – [user442446](#) Sep 13 '10 at 7:52

[add a comment](#)

## 3 Answers

[Active](#) [Oldest](#) [Votes](#)

There are two ways how to arrange several plots with base graph functions, namely `par(mfrow=c(rows,columns))` (substitute `rows` and `columns` with integers) and `layout(mat)` where `mat` is a matrix like `matrix(c(1,2,3,4), 2, 2)`.

4

**The Overflow Blog**

- [The Loop: Adding review guidance to the help center](#)
- [Podcast 288: Tim Berners-Lee wants to put you in a pod. A web pod.](#)

**Featured on Meta**

- [A big thank you, Tim Post](#)
- ["Question closed" notifications experiment results and graduation](#)

**37 people chatting**R Public  
2 hours ago - Natty**Linked**0 [Size comparison in R\(data-visualization\)](#)



#rstats

...

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[github.com/rweekly/rweekl...](https://github.com/rweekly/rweekl...)

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@R4DScommunity

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**David Smith**

@revodavid

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Cloud Advocate at Microsoft. Tweets about AI, Data Science, R #rstats and other things I love: culture, politics, gaming, my husband @nonfamousjay. He/him.

**Meghan Hall**

@MeghanMHall

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Data analyst by day, hockey nerd by night. Likes: goalie pulling, penalty

Likes: [#rstats](#) [#TidyTuesday](#) [#WriteR](#) [#hockeygraphs](#) [#cheatSheet](#) [#Gmail](#)



ChatGPT

DALL-E

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Today

R Programming IA Expert ...

Previous 7 Days

DNA Extraction from Leaves

AI Data Analysis for Plant Breeding

Plant Breeder in Field

ChatGPT 3.5 ▾

DM

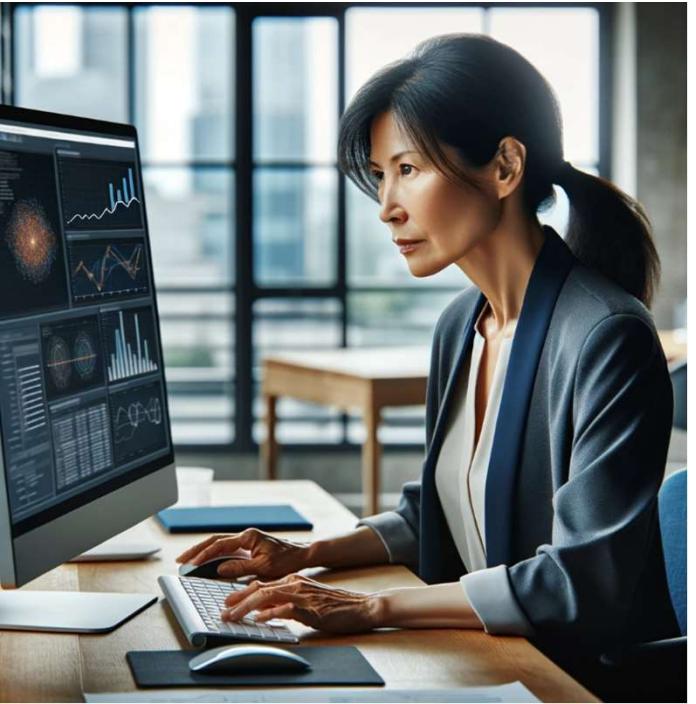
You

I want you act as an IA expert in R programing.

ChatGPT

Of course! I'd be happy to assist you with any questions or tasks related to R programming and data analysis. Please feel free to ask any specific questions you have or let me know what kind of help you need, and I'll do my best to provide you with the information and guidance you require. Whether it's about data manipulation, statistical analysis, data visualization, or any other aspect of R programming, I'm here to help.

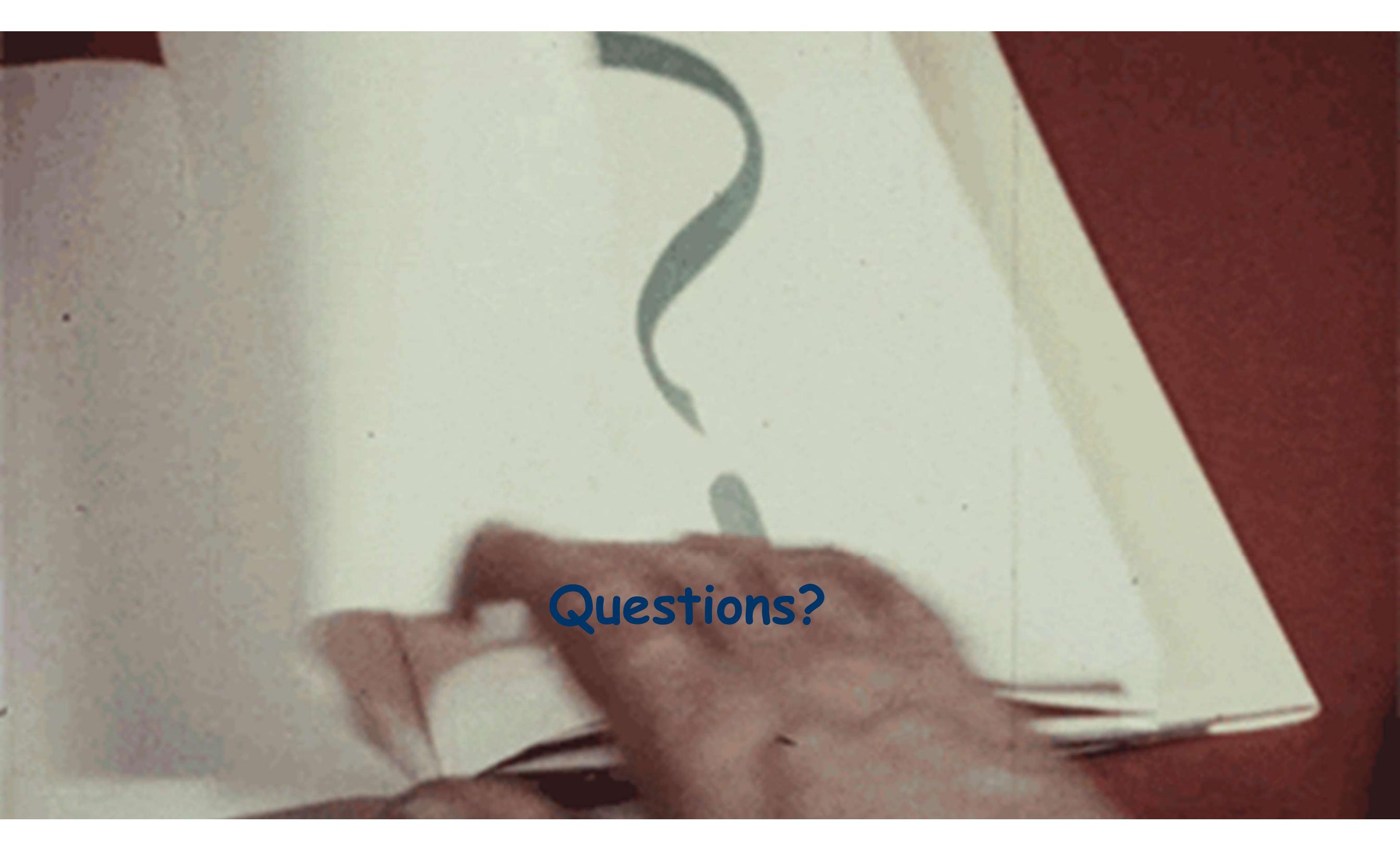




# Data Science for Agricultural Science Packages



Map of Australia as R package hex stickers; image credit: Mitchell O'Hara-Wild



Questions?



**Thank you.**