

# Introduction to R: Operators

Research Methods for Human Inquiry  
Andrew Perfors

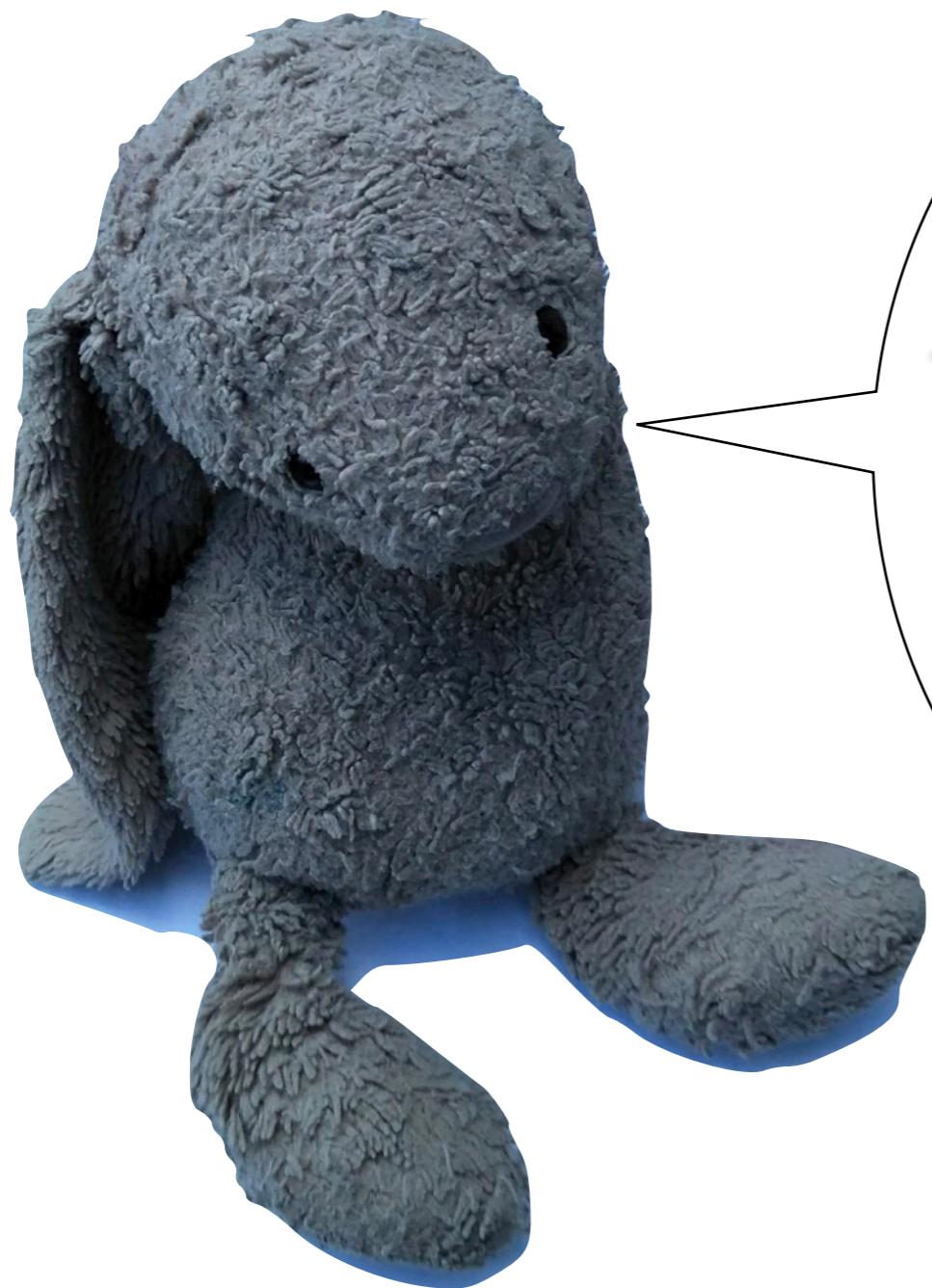
# Let's get started on our learning journey!



... Which we'll share  
with our friends  
Bunny and Gladly  
Teddy

\* Yes I am completely aware that this is ridiculous and I'm a ridiculous person. Humour me. I may have lost my mind and all sense of aesthetic judgment from having kids, but Bunny and Gladly are making these lectures more fun so why not?

# This is Bunny



I live in Bunnyland! I have lots of sisters and friends. I'm here because I want to be a psychologist but learning statistics and R sound so scary. And also seems completely unnecessary to be a psychologist. You meanie!

# This is Gladly

I live in Bunnyland too, and I don't know why it's called that because I'm not a bunny, I'm a bear. I am excited to learn statistics and R because I like learning new things. But I don't know what I want to do with my life and I'm not very smart so I don't know if I can.



# About R and RStudio

# What is R?

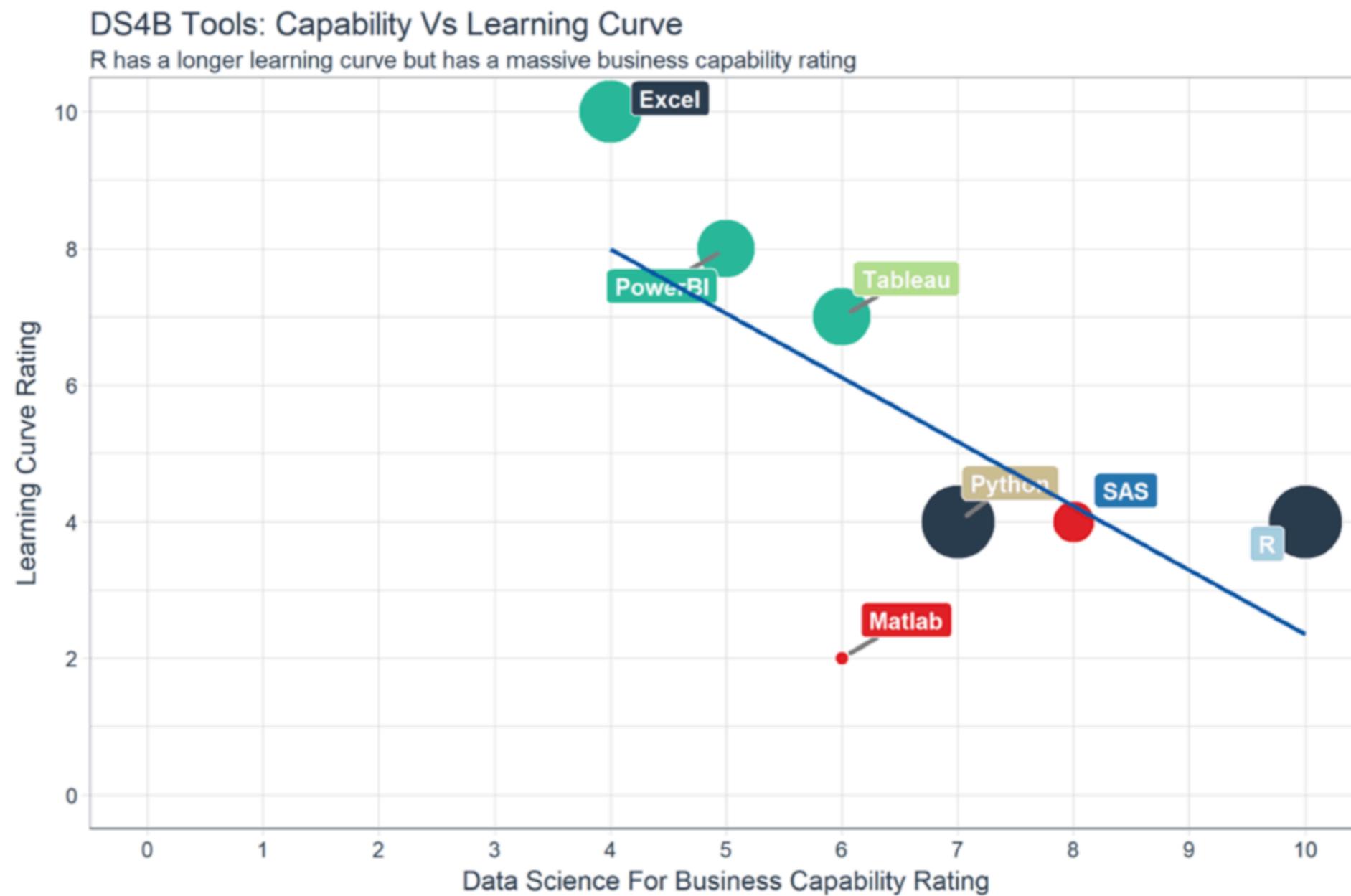
- R is a statistical programming language

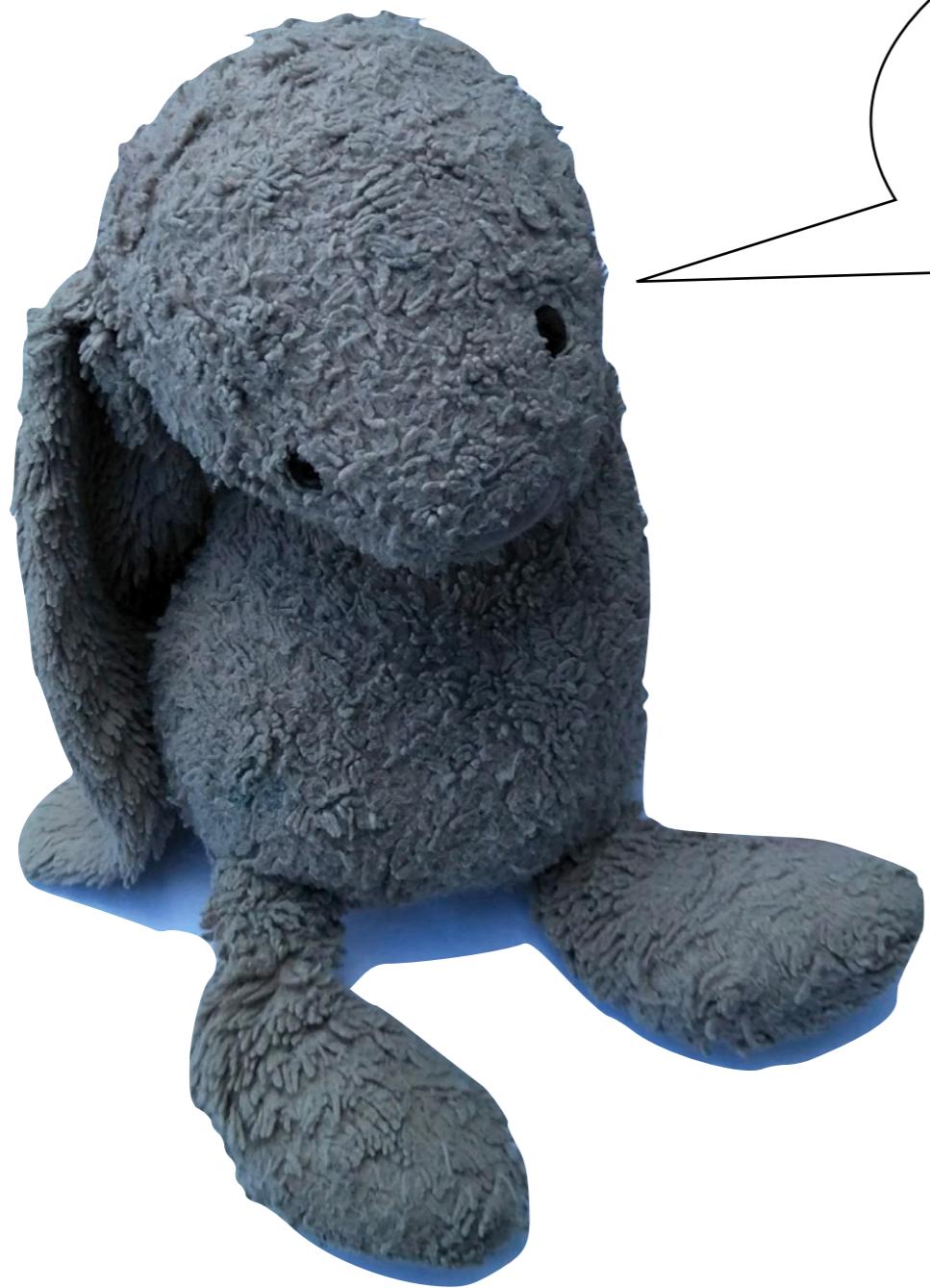
# What is R?

- R is a statistical programming language
- You can use it to
  - Do basic calculations
  - Do statistical analyses
  - Draw graphs
  - Write programs and apps
  - Make webpages
  - Create generative art
  - Write papers, CVs, and other documents

# Why do we teach R?

- Minuses:
  - It's got a steeper learning curve than some alternatives
  - (As always: don't panic. Previous classes did just fine on this!)



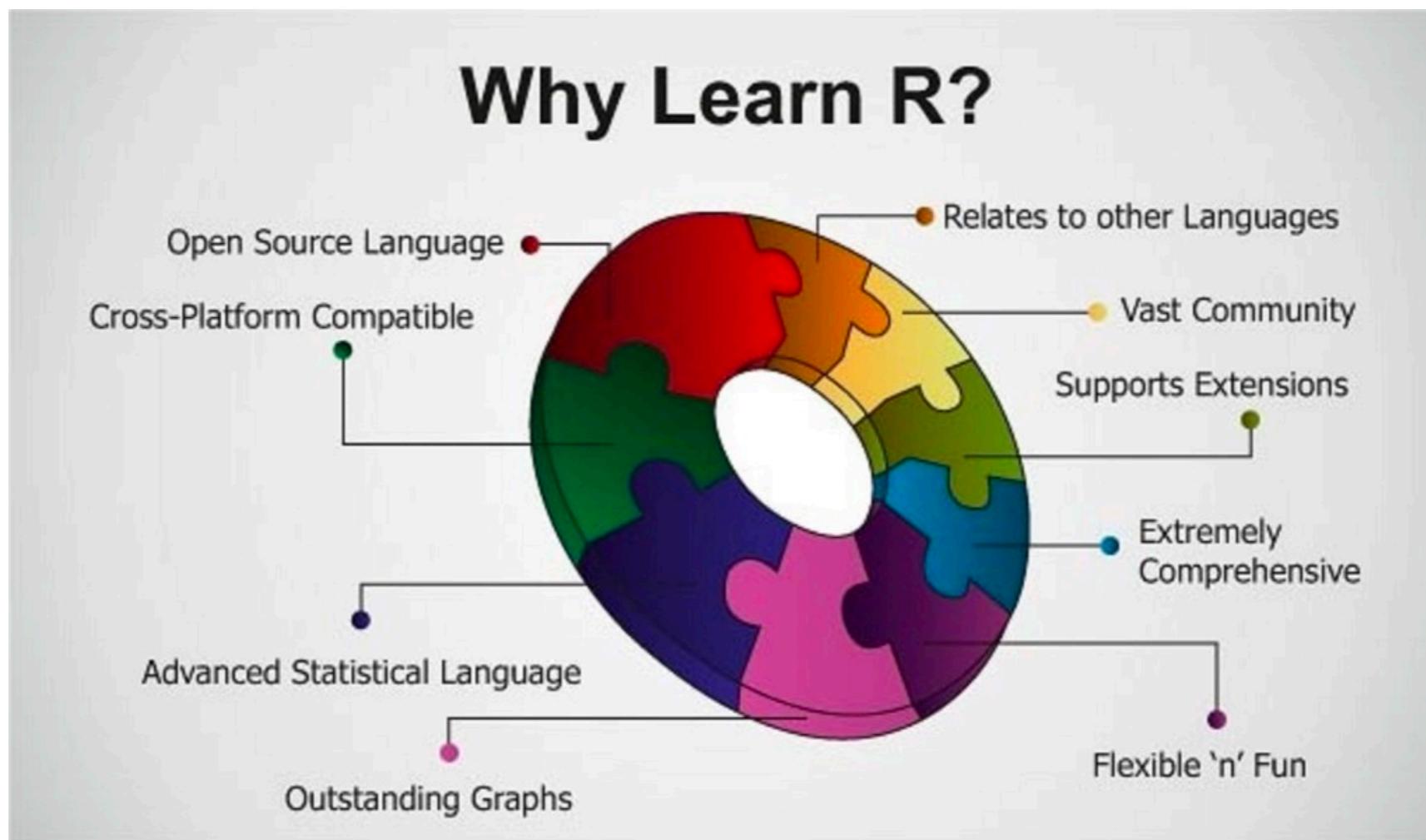


Steeper learning curve... that  
does not sound good...

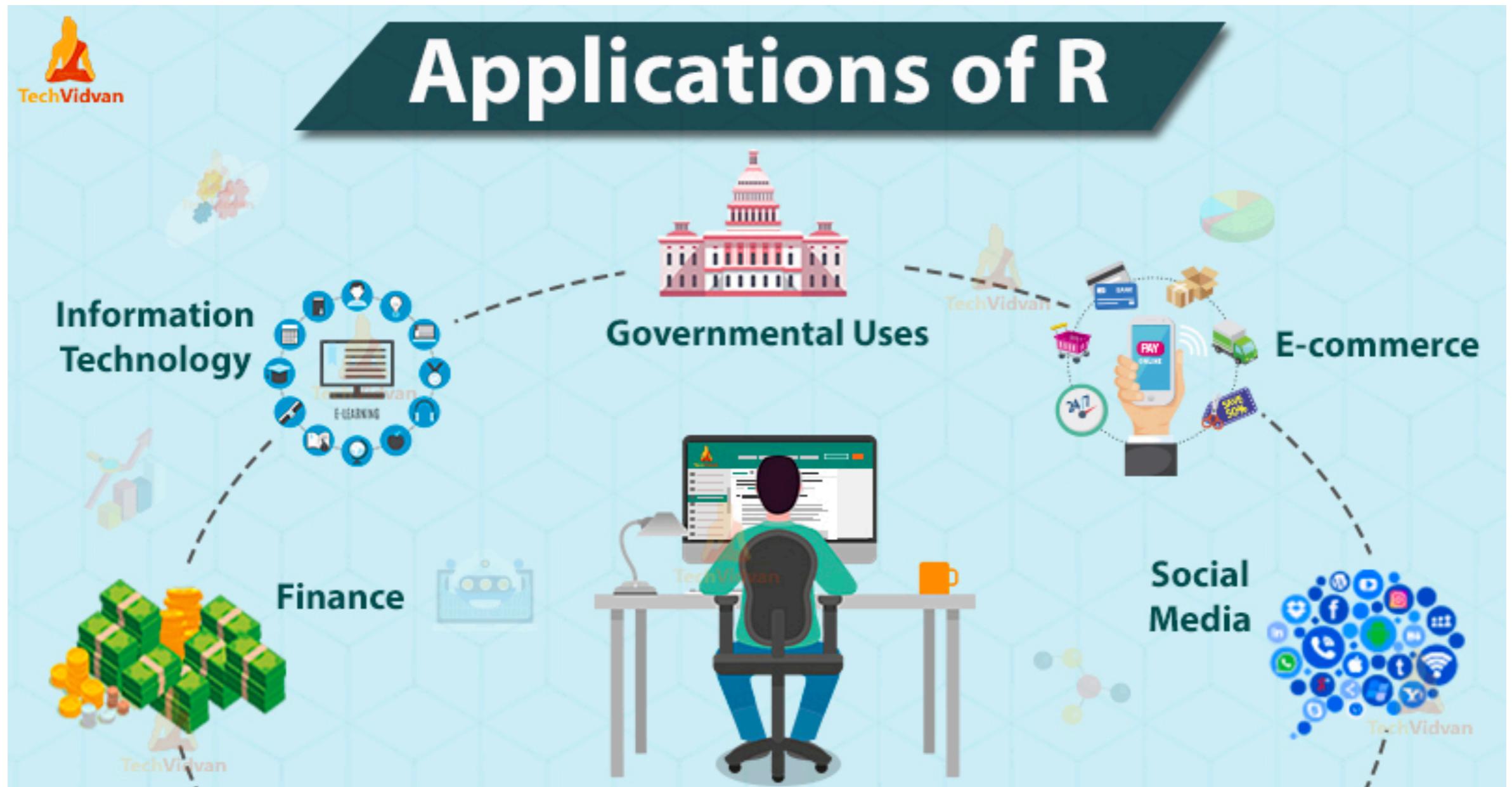
# Why do we teach R?

- Pluses:

- It's open source and **costs nothing**
- It's very powerful (way more powerful than this class suggests)
- It's rapidly becoming the most popular data analysis tool
- It's also (secretly) an introduction to programming (a valuable skill!)



It is used everywhere, for more and more jobs



# It is used everywhere, for more and more jobs

**Recently IEEE spectrum comes with the ranking sheet of top programming languages in 2024 according to their popularity – Programming Languages Popularity.**

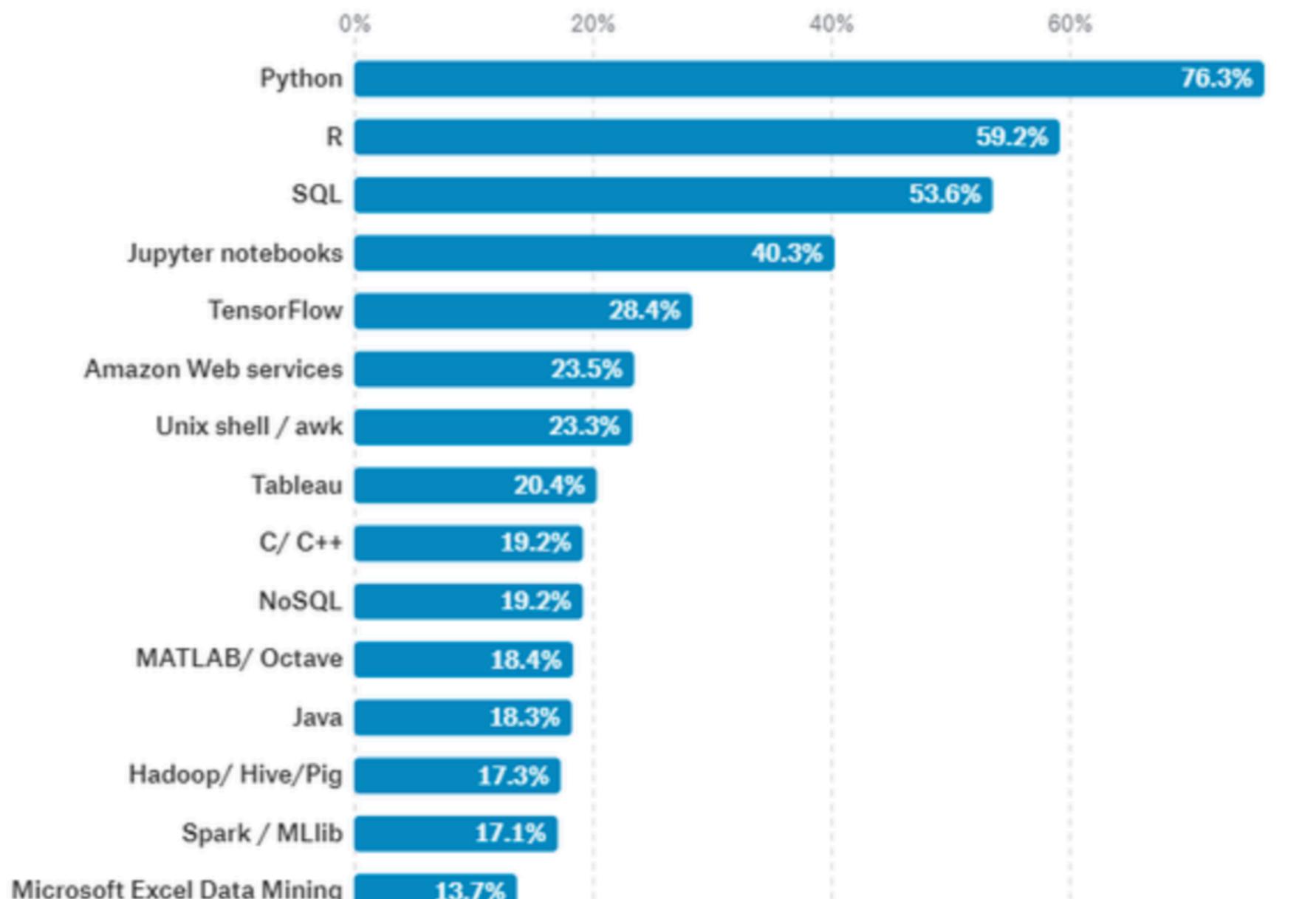
R ranks as one of the most popular languages even though it is focused on statistics and data analysis



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# It is used *everywhere*, for more and more jobs

One of the most requested languages for data science



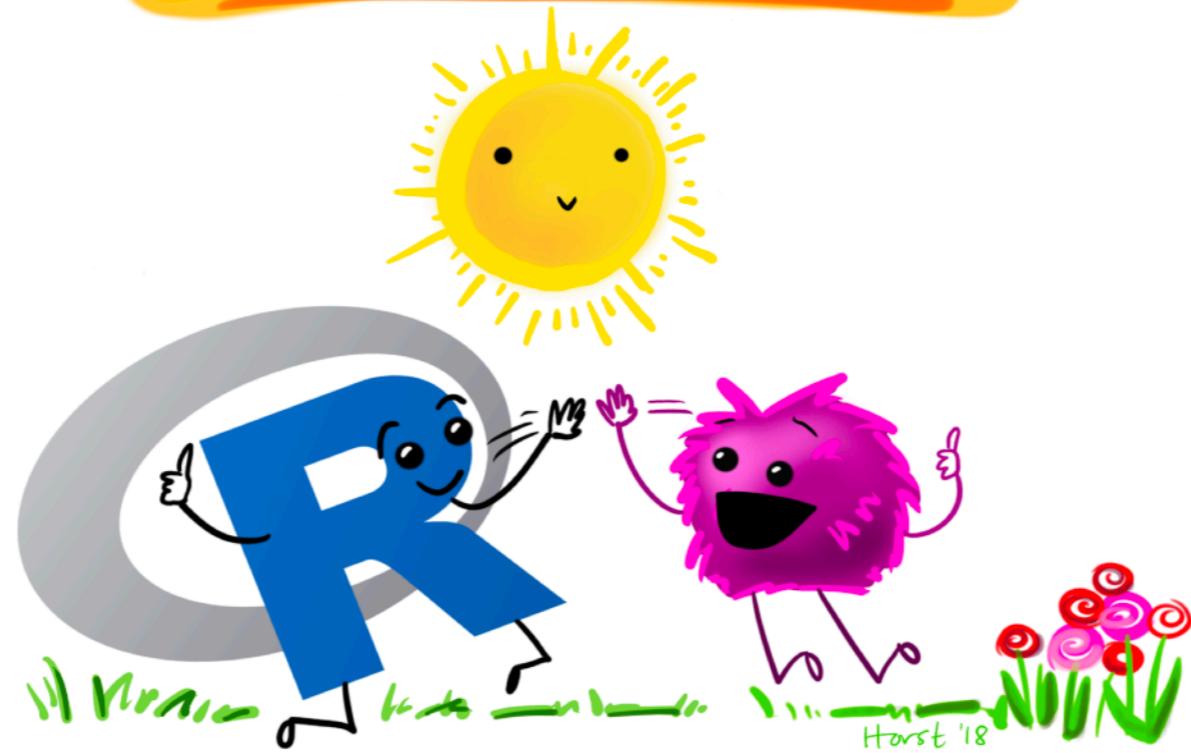
7,955 responses

Only displaying the top 15 answers. There are 38 answers not shown.

at first I was like...



...but now it's like...

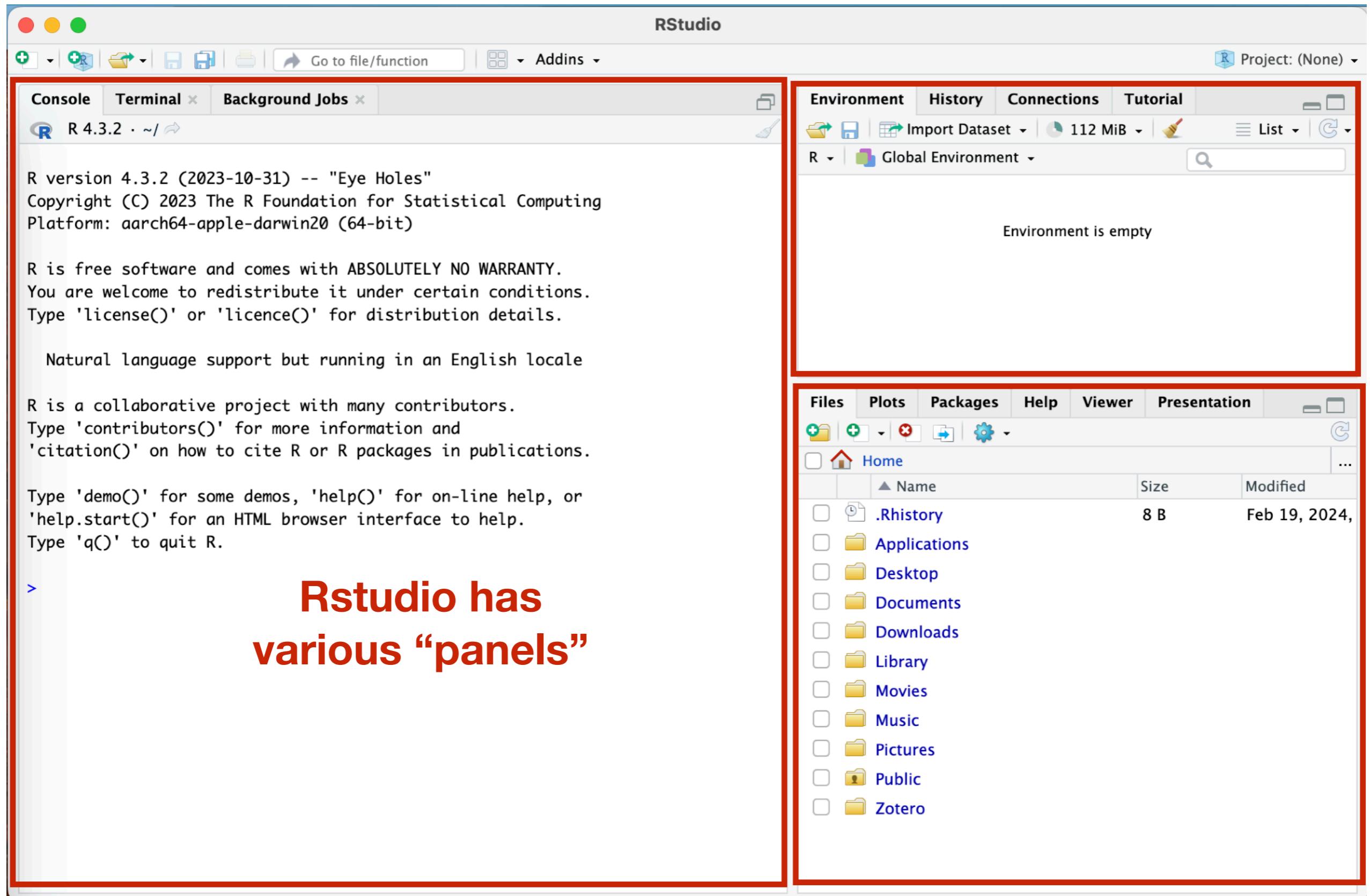


# Getting R and Rstudio

- You should have them on your computer already
- If you don't, the websites you need are:
  - <http://www.r-project.org/> (install R first, it's the language)
  - <http://www.rstudio.com> (install Rstudio next, it's the environment)
- There are documents on Canvas describing the process in detail, depending on your operating system
- Check on the discussion board if you have problems!



This is the icon for Rstudio.  
Open this to get started



**Rstudio has  
various “panels”**

Note: I use a Mac and all my screenshots will be from that.  
There may be subtle differences if you have Windows, but nothing substantial will differ.

R version 4.3.2 (2023-10-31) -- "Eye Holes"  
Copyright (C) 2023 The R Foundation for Statistical Computing  
Platform: aarch64-apple-darwin20 (64-bit)

R is free software and comes with ABSOLUTELY NO WARRANTY.  
You are welcome to redistribute it under certain conditions.  
Type 'license()' or 'licence()' for distribution details.

Natural language support but running in an English locale

R is a collaborative project with many contributors.  
Type 'contributors()' for more information and  
'citation()' on how to cite R or R packages in publications.

Type 'demo()' for some demos, 'help()' for on-line help, or  
'help.start()' for an HTML browser interface to help.  
Type 'q()' to quit R.

>

**Click on these to bring up different “panels” (we’ll talk about them later)**

The screenshot shows the RStudio desktop application. The top menu bar includes 'File', 'Edit', 'View', 'Code', 'Tools', 'Help', and 'Addins'. The 'Console' tab is selected in the top-left panel. The right side of the interface features several panels: 'Environment', 'History', 'Connections', and 'Tutorial' are at the top, each with a red border; below them are 'Files', 'Plots', 'Packages', 'Help', 'Viewer', and 'Presentation', also each with a red border. The 'Files' panel displays a file tree under 'Home' with the following structure:

Name	Size	Modified
.Rhistory	8 B	Feb 19, 2024,
Applications		
Desktop		
Documents		
Downloads		
Library		
Movies		
Music		
Pictures		
Public		
Zotero		

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>

The console is the most important part. That's R running inside it!

The screenshot shows the RStudio interface. The top menu bar includes 'RStudio', 'File', 'Edit', 'View', 'Project', 'Help', and 'About'. The top toolbar has icons for file operations like Open, Save, Print, and Go to file/function. The main window has tabs for 'Console' (selected), 'Terminal', and 'Background Jobs'. The 'Console' tab shows the R startup message. The 'Environment' pane shows 'Global Environment' with the message 'Environment is empty'. The 'Files' pane shows a directory tree under 'Home' with folders like Applications, Desktop, Documents, Downloads, Library, Movies, Music, Pictures, Public, and Zotero. The 'Plots' and 'Packages' panes are also visible.

Basic commands

Console Terminal × Background Jobs ×

R 4.3.2 · ~/

```
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```

> |

You type **commands** here, at the  
“command prompt”

# Our first command...

The > is the command prompt

This is a command

```
> 10 + 3  
[1] 13
```

The number 13 is the output  
(don't worry about the [1] for now)

# Simple calculations

- + addition
- subtraction
- \* multiplication
- / division
- ^ taking powers



These are referred to as “**operators**”  
(each operator is used to carry out  
a particular kind of operation)

```
> (6 - 4) / 2  
[1] 1  
  
> 6 - (4/2)  
[1] 4
```



When performing multiple calculations, use  
parentheses to make sure R does the  
calculations in the desired order

(Note: without parentheses, the order is: ^ first,  
then \* and / second (left to right), and then + and -  
last (left to right). No-one remembers this at first.)

# Logical statements

```
== equality  
!= inequality  
> greater than  
>= greater than or equal to  
< less than  
<= less than or equal to
```

```
& AND  
| OR  
! NOT
```

```
> 10 < 100  
[1] TRUE
```

```
> 2 + 2 == 5  
[1] FALSE
```

```
> (10 < 100) | (2 + 2 == 5)  
[1] TRUE
```

```
> (10 < 100) & (2 + 2 == 5)  
[1] FALSE
```

# Exercises

1. One mile is 1.61 kilometres. Use R to figure out how many kilometres 5 miles are.
2. Use R to calculate  $(8+4)^{*}12$ . How is that different from  $8+4^{*}12$ ?
3. TRUE or FALSE? eight is less than six
4. TRUE OR FALSE?  $5^2$  is equal to 81?
5. TRUE OR FALSE? (4 is greater than or equal to 22) AND (1 is less than -1 times -1)