

Getting Started with R

17 January 2020

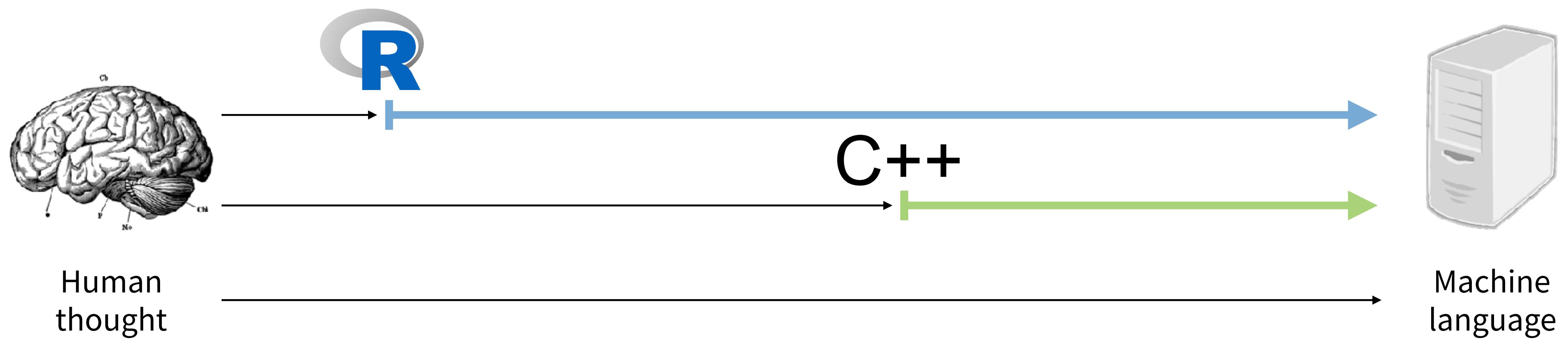
Molly Lewis
Lab

Course Website: <https://cumulativescience.netlify.com/>

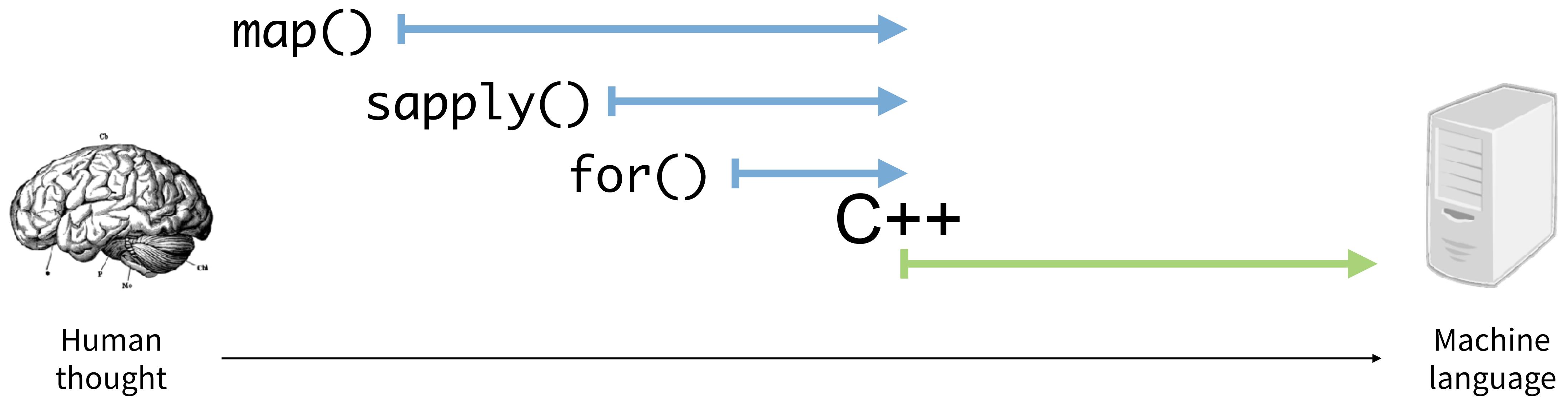
Why R

- Free (open-source)
- Programming language (not point-and-click)
- Excellent graphics
- Offers broadest range of statistical tools
- Easy to generate reproducible reports
- Easy to integrate with other tools

R - A computer language for scientists

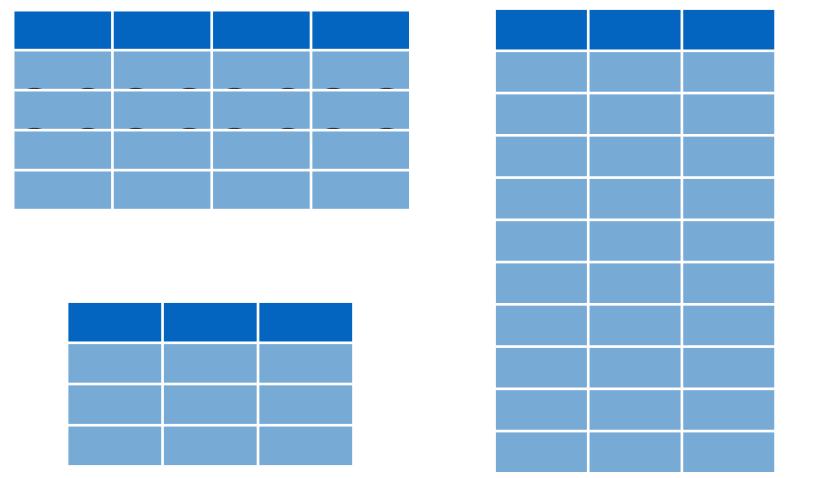


R - A computer language for scientists

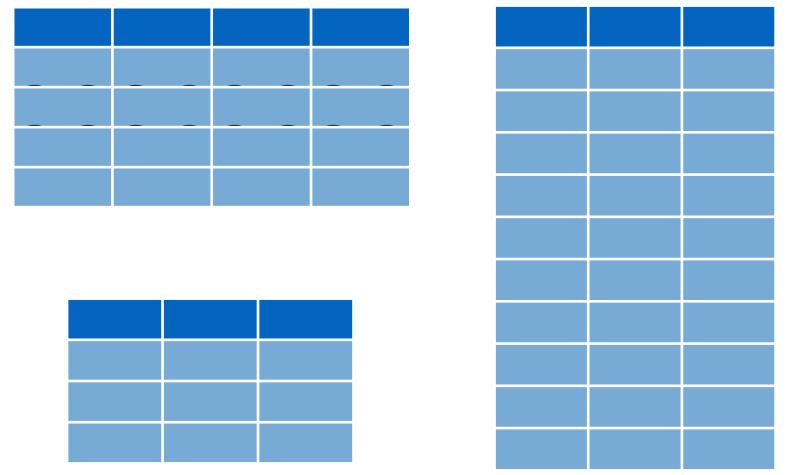
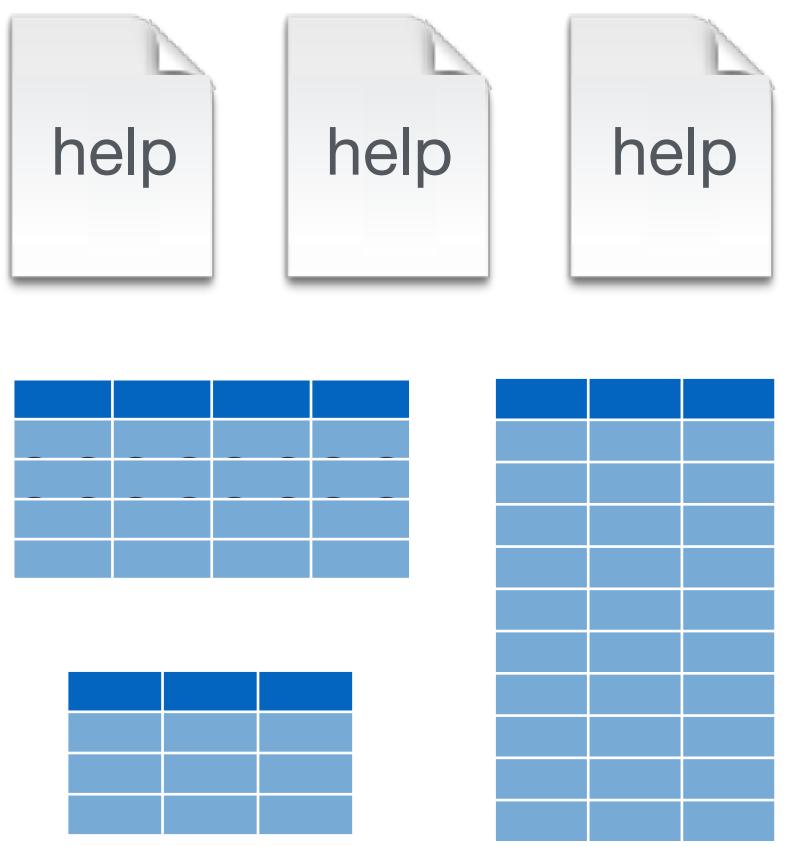


R Packages

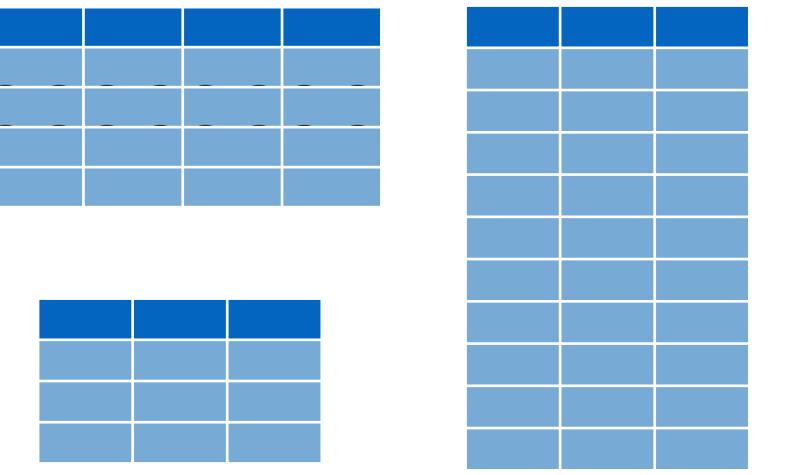
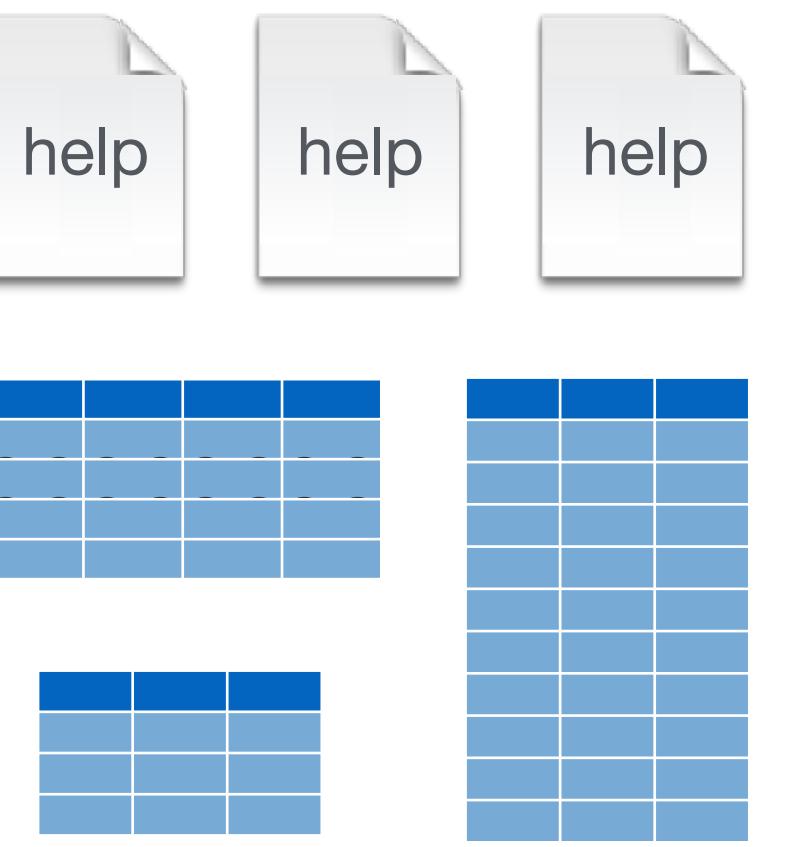




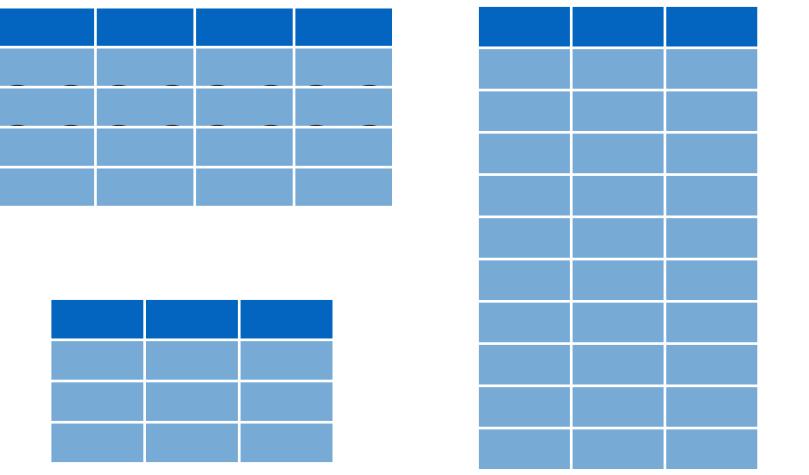
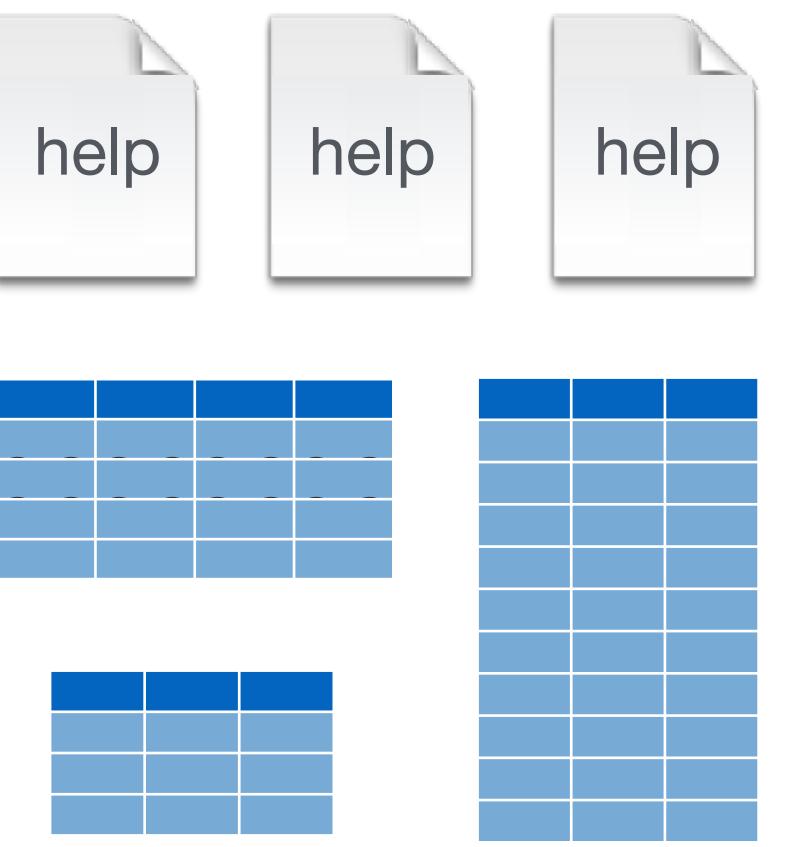
function1()
function2()
function3()
function4()



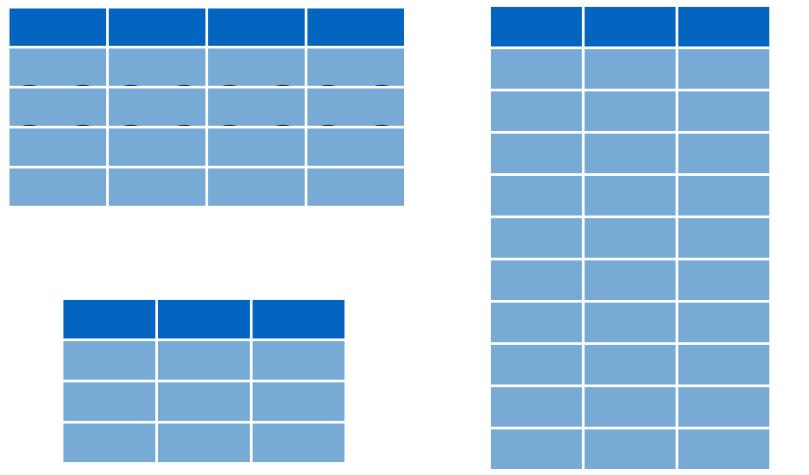
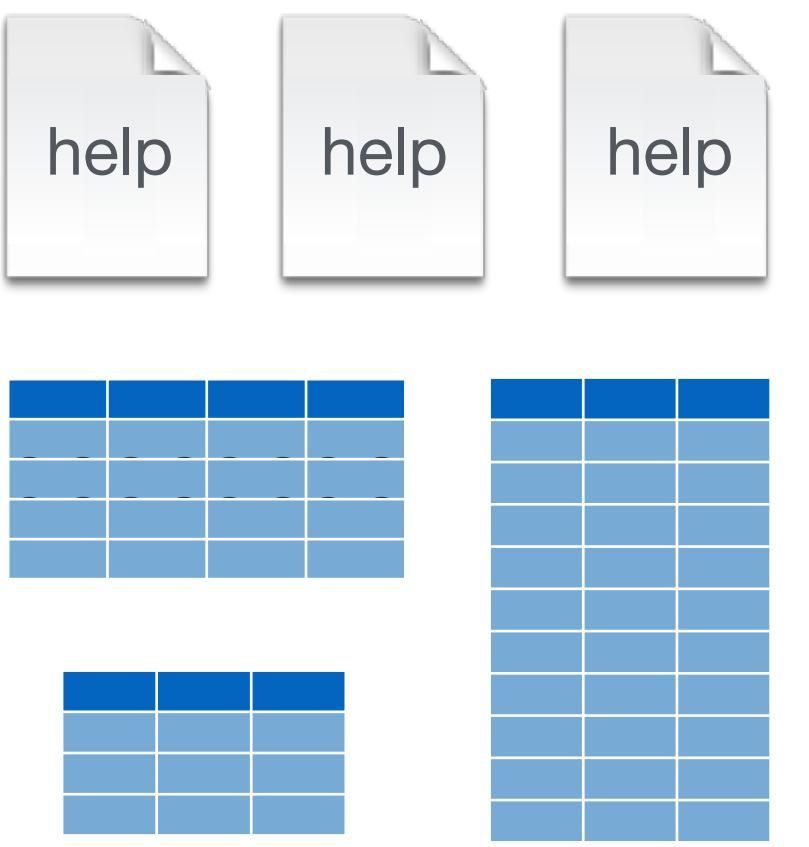
function1()
function2()
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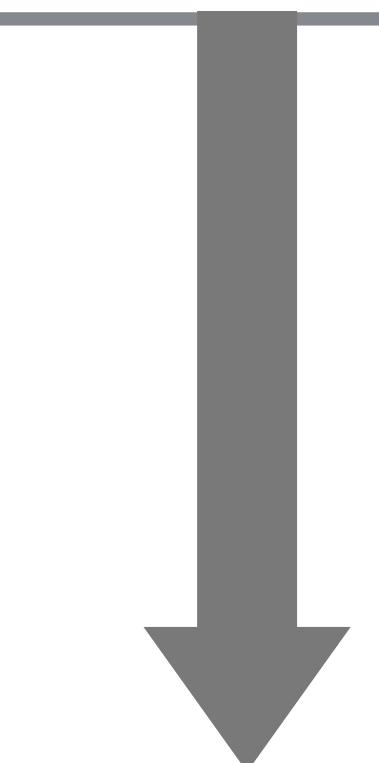
function5()
function6()
function7()
function8()



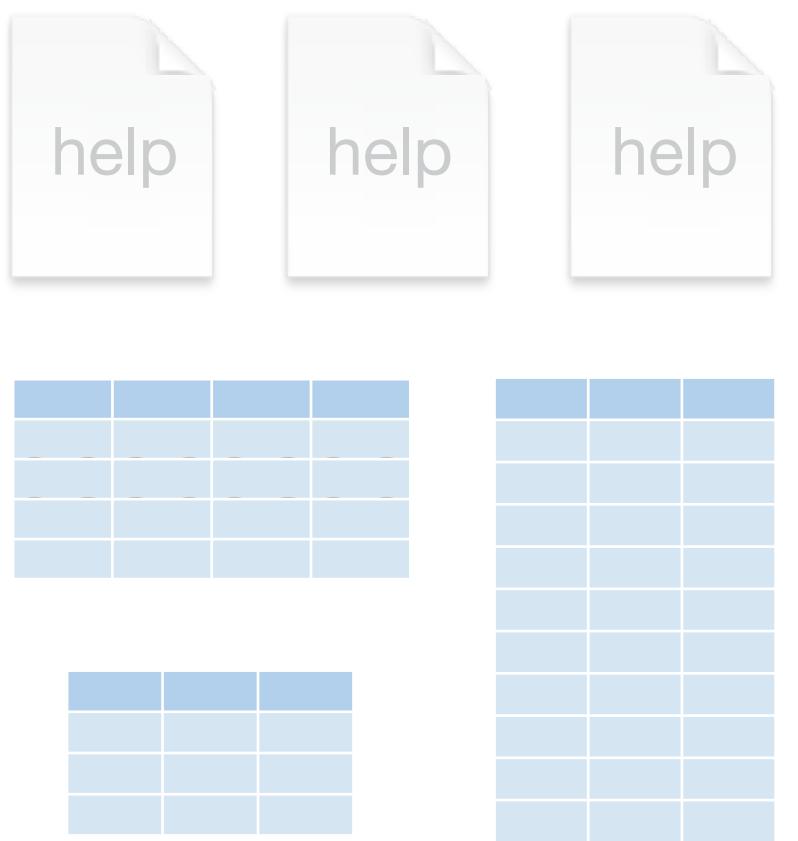
function9()
functionA()
functionB()
functionC()



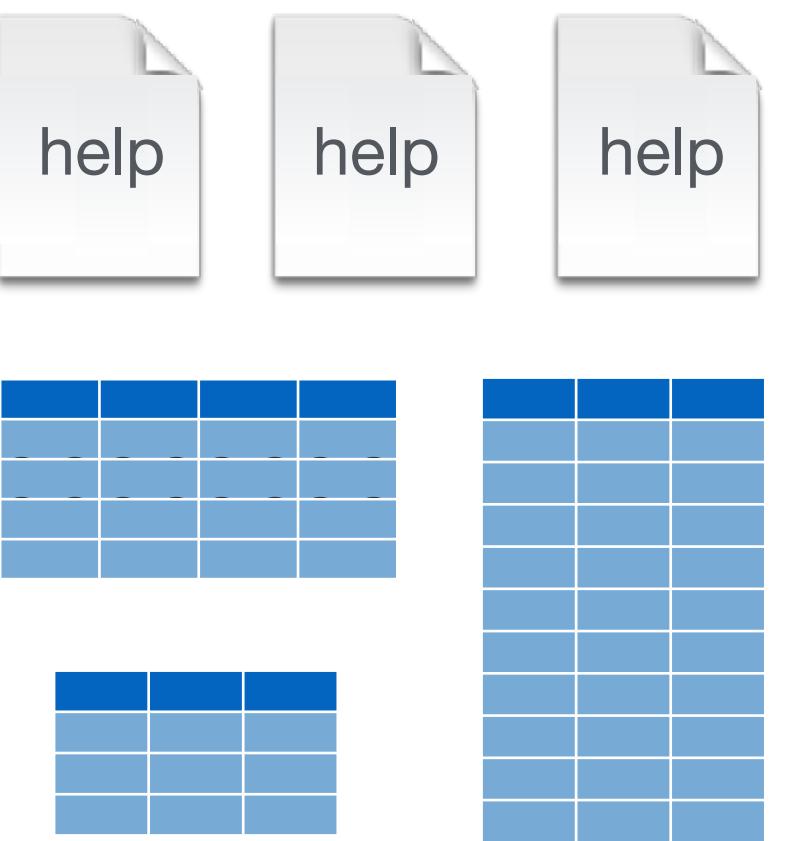
functionD()
functionE()
functionF()
functionG()



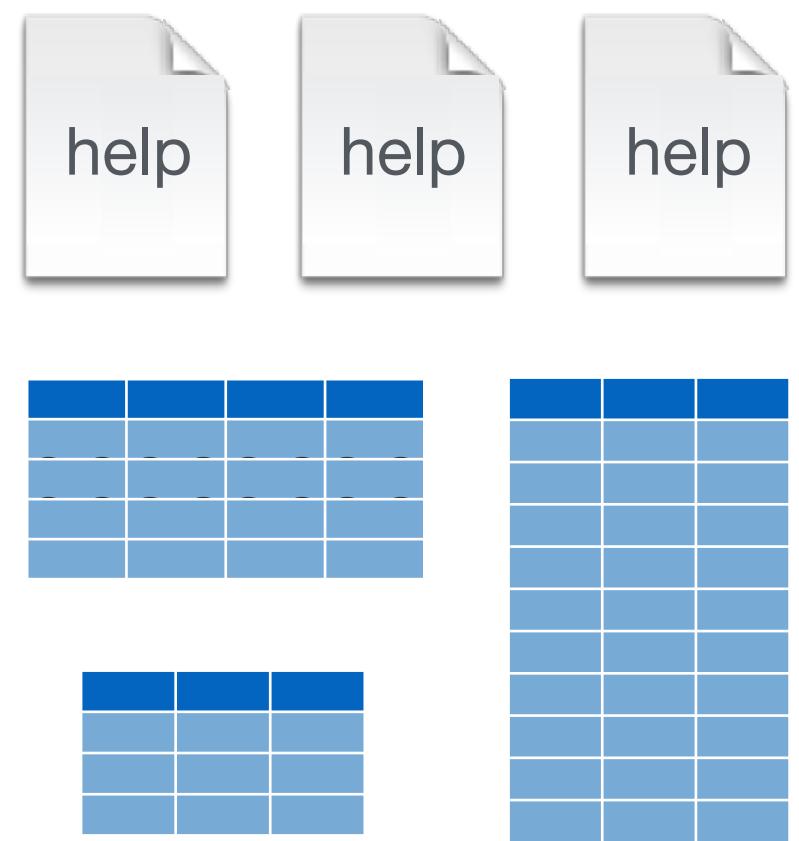
Base R



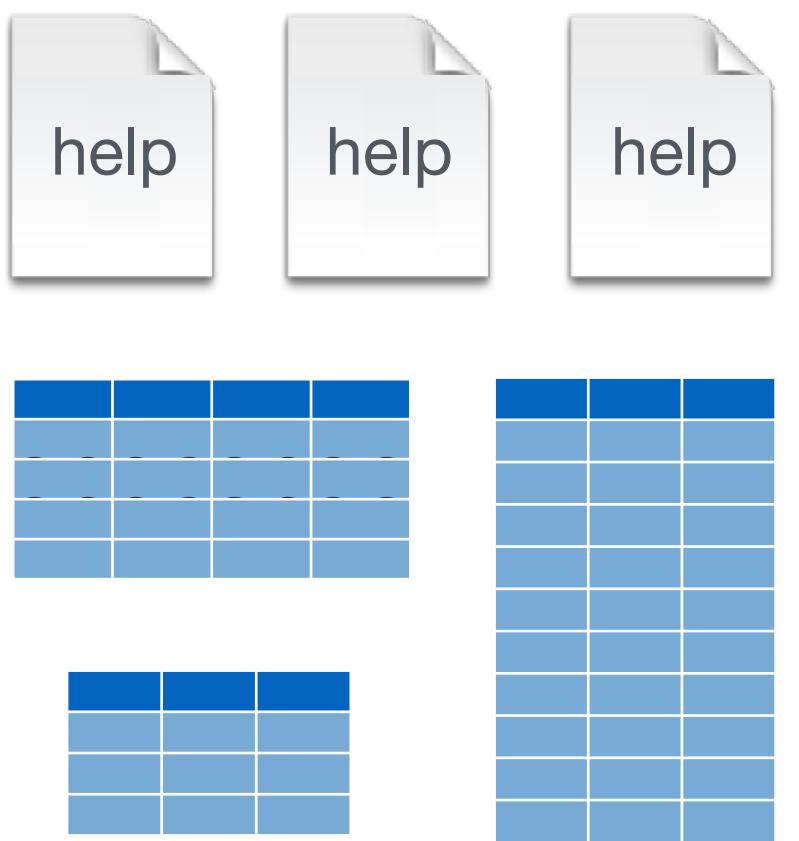
function1()
function2()
function3()
function4()



function5()
function6()
function7()
function8()



function9()
functionA()
functionB()
functionC()



functionD()
functionE()
functionF()
functionG()

Base R

R Packages



The Comprehensive R Archive x Garrett

Secure | https://cran.r-project.org

Available CRAN Packages By Name

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

A3	Accurate, Adaptable, and Accessible Error Metrics for Predictive Models
abyyR	Access to Abbyy Optical Character Recognition (OCR) API
abc	Tools for Approximate Bayesian Computation (ABC)
ABCAnalysis	Computed ABC Analysis
abc.data	Data Only: Tools for Approximate Bayesian Computation (ABC)
abcdeFBA	ABCDE_FBA: A-Biologist-Can-Do-Everything of Flux Balance Analysis with this package
ABCOptim	Implementation of Artificial Bee Colony (ABC) Optimization
ABCp2	Approximate Bayesian Computational Model for Estimating P2
ABC.RAP	Array Based CpG Region Analysis Pipeline
abcrf	Approximate Bayesian Computation via Random Forests
abctools	Tools for ABC Analyses
abd	The Analysis of Biological Data
abf2	Load Gap-Free Axon ABF2 Files
ABHgenotypeR	Easy Visualization of ABH Genotypes
abind	Combine Multidimensional Arrays
abjutils	Useful Tools for Jurimetric Analysis Used by the Brazilian Jurimetrics Association
abn	Modelling Multivariate Data with Additive Bayesian Networks
abodOutlier	Angle-Based Outlier Detection

Using packages

1

```
install.packages("foo")
```

Downloads files to computer

1 x per computer

2

```
library("foo")
```

Loads package

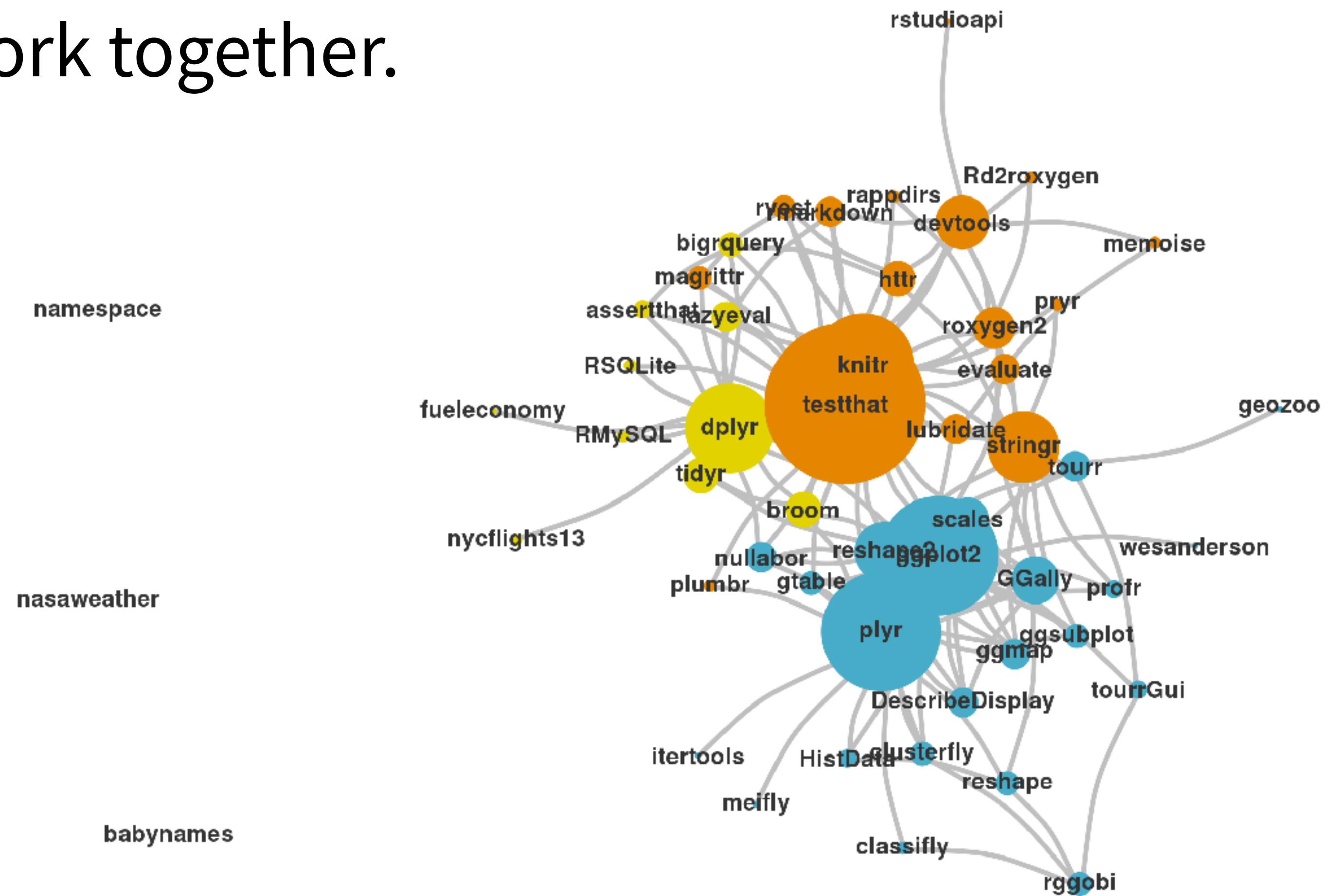
1 x per R Session

The Tidyverse

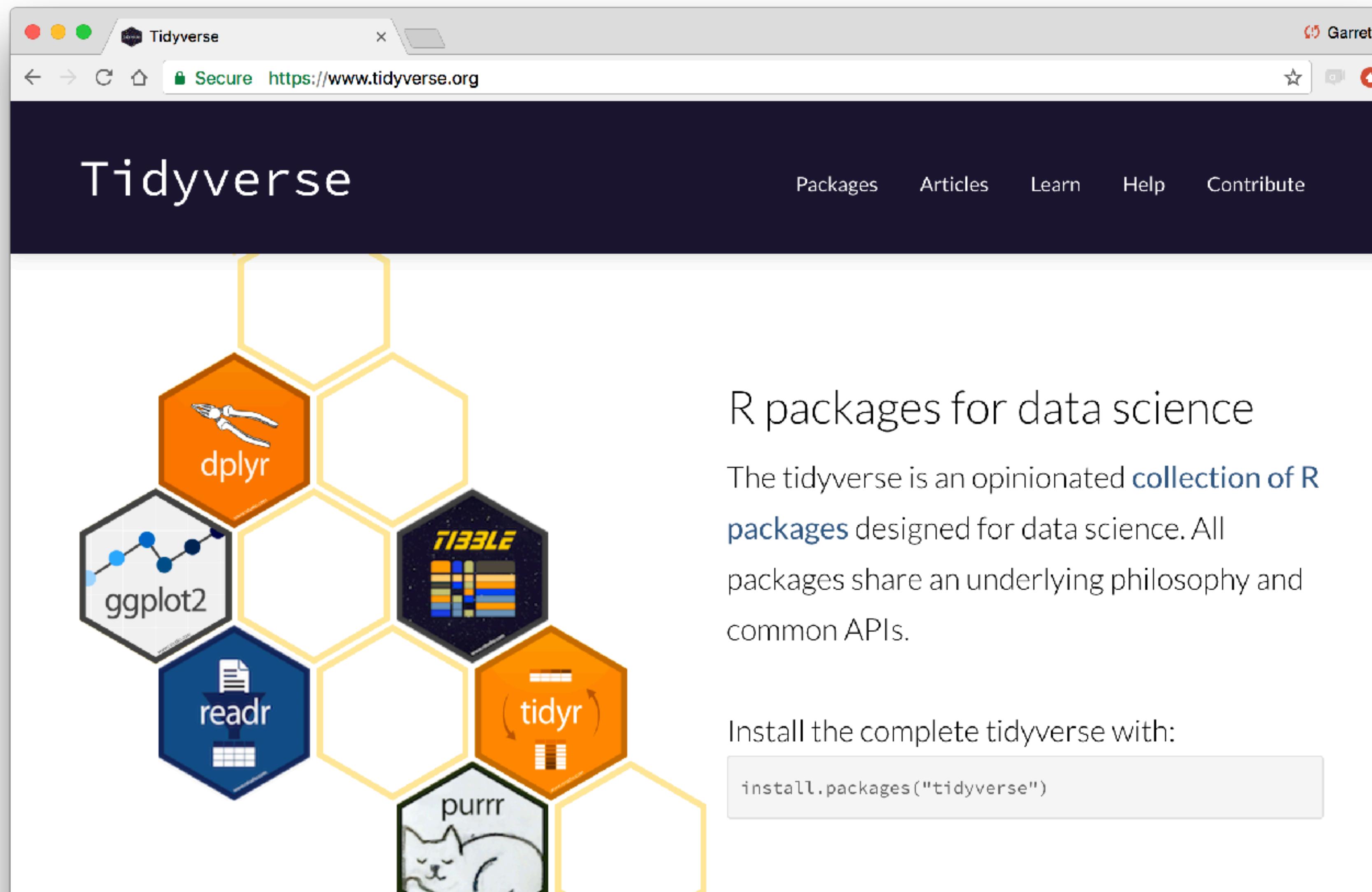


The Tidyverse

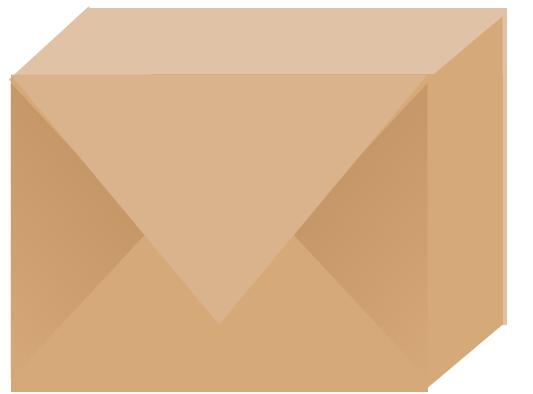
A collection of modern R packages that share common philosophies, embed best practices, and are designed to work together.



tidyverse.org



tidyverse



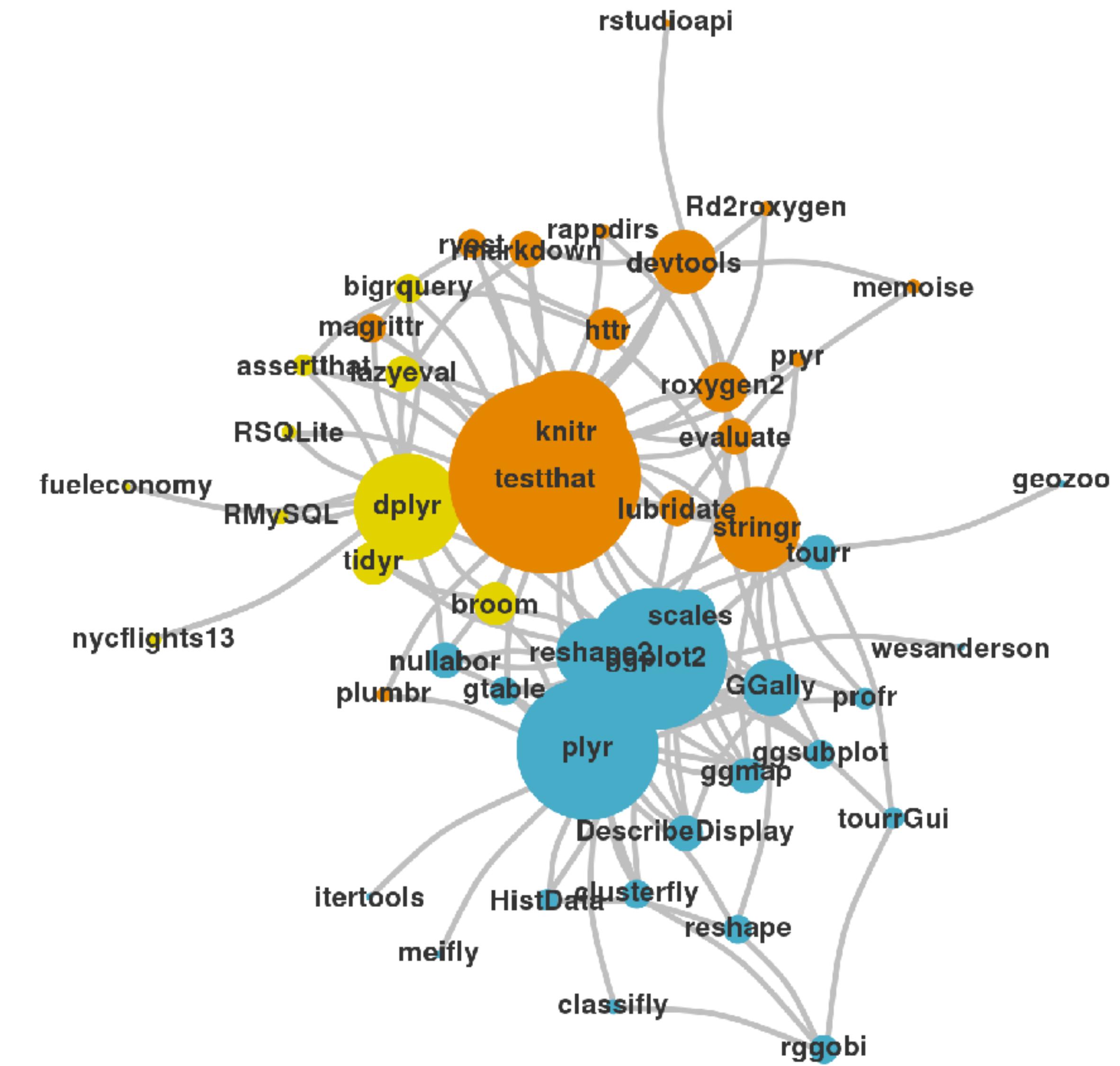
An R package that serves as a short cut for installing and loading the components of the tidyverse.

```
library("tidyverse")
```

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

does the equivalent of

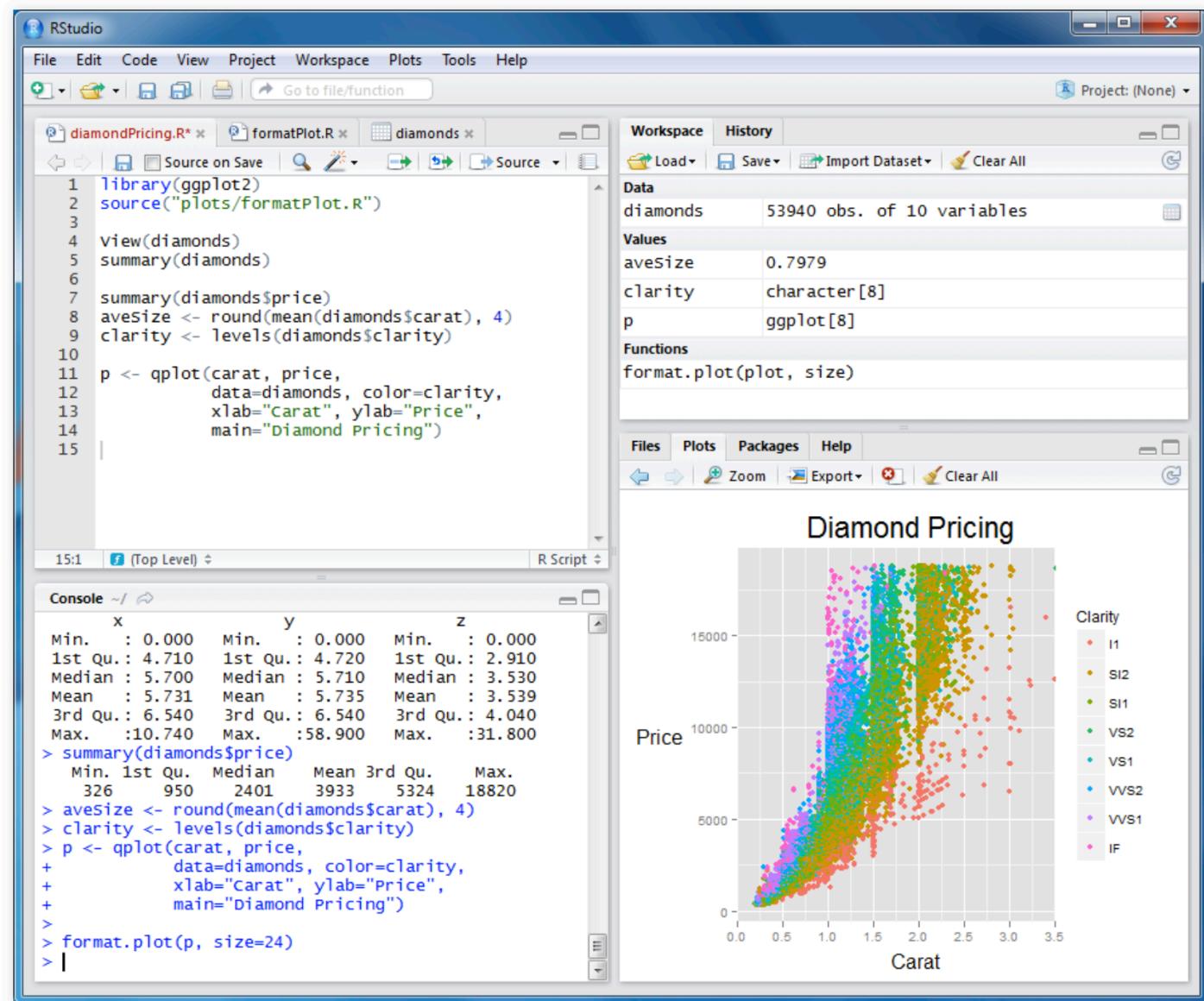
```
install.packages("ggplot2")
install.packages("dplyr")
install.packages("tidyr")
install.packages("readr")
install.packages("purrr")
install.packages("tibble")
install.packages("hms")
install.packages("stringr")
install.packages("lubridate")
install.packages("forcats")
install.packages("DBI")
install.packages("haven")
install.packages("httr")
install.packages("jsonlite")
install.packages("readxl")
install.packages("rvest")
install.packages("xml2")
install.packages("modelr")
install.packages("broom")
```



RStudio is an IDE for R

RStudio has 4 main windows ('panes'):

- Source
- Console
- Workspace/History
- Files/Plots/Packages/Help



RStudio: Panes overview

1. **Source** pane: create a file that you can save and run later
2. **Console** pane: type or paste in commands to get output from R
3. **Workspace/History** pane: see a list of variables or previous commands
4. **Files/Plots/Packages/Help** pane: see plots, help pages, and other items in this window.

R Markdown, R Notebooks

- R Markdown allows the user to integrate R code into a report
- When data changes or code changes, so does the report
- No more need to copy-and-paste graphics, tables, or numbers
- Creates **reproducible** reports
 - Anyone who has your R Markdown (.Rmd) file and input data can re-run your analysis and get the exact same results (tables, figures, summaries)
 - R Notebooks are R Markdown documents that allow you to execute code interactively and view the output in the notebook itself.
- Can output report in HTML (default), Microsoft Word, or PDF

R Notebooks

An authoring format for Data Science.

The screenshot shows the RStudio interface with an R Notebook open. The notebook file is titled "R-Notebook.Rmd". The code editor pane contains the following R Markdown code:

```
1 ---  
2 title: "R Notebook"  
3 output: html_notebook  
4 ---  
5  
6 Text written in **markdown**  
7  
8 ```{r}  
9 # code written in R  
10 (x <- rnorm(7))  
11 ````  
12  
13 Text written in _markdown_  
14  
15 ```{r}  
16 # code written in R  
17 hist(x)  
18 ````  
19  
20 (Top Level) ⇣
```

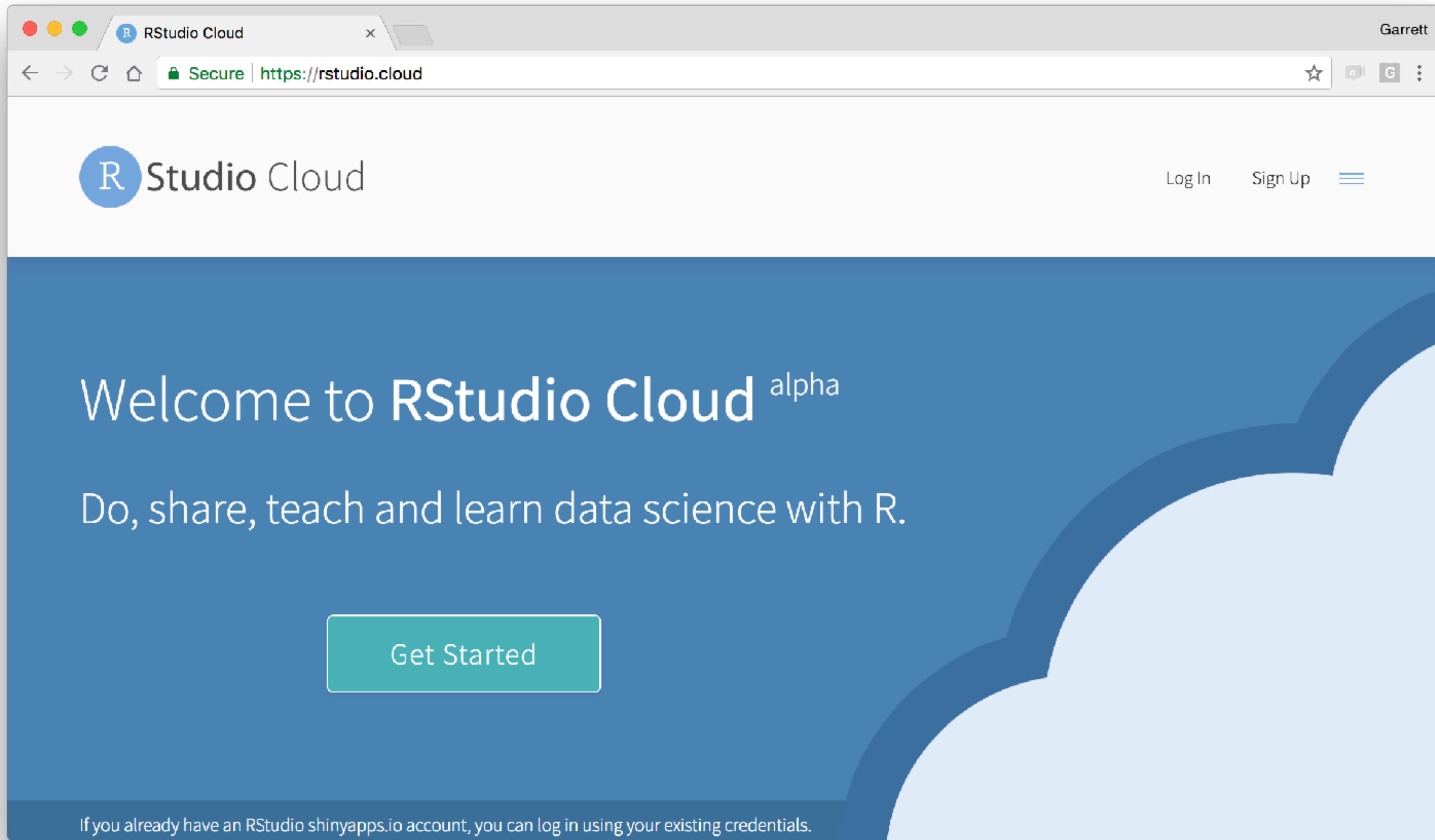
The console pane below shows the output of the R code:

```
[1] -1.2  1.0 -0.5  0.9 -0.6 -1.1 -1.5
```

Three callout boxes highlight features of the interface:

- A grey callout box points to the "Run All" button in the toolbar, with the text: "Click to run all code chunks above".
- A grey callout box points to the "Run Current Chunk" button in the toolbar, with the text: "Click to run code in chunk".
- A dark grey callout box points to the console output, with the text: "Code result".

http://rstudio.cloud





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Join Space?

Joining a space gives you access to it and to its contents.

Once you join, admins will be able to see your email address.

Would you like to join this space?

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Welcome to cumulative_science_2020

Course workspace for Modern Research Methods: Cumulative Science, Big data, and Meta-Analysis 85311.

If you did not intend to join this space, or you later decide you don't want to be a member, just go to the [Members](#) area and click "Leave Space".

Click "start" Assignment0

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START 

Molly Lewis

1/17/20

Created Jan 11, 2020 5:09 PM

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Feedback and Questions

Click on 00_MRM_assignment_template.Rmd in the bottom right corner.

The screenshot shows the RStudio interface with the following components:

- Top Bar:** File, Edit, Code, View, Plots, Session, Build, Debug, Profile, Tools, Help.
- Toolbar:** Go to file/function, Addins.
- Code Editor:** The main workspace displays the R Markdown file `00_MRM_assignment_template.Rmd`. The code includes YAML front matter and R code chunks. A red arrow points to the file name in the bottom right corner of the editor area.
- Environment Panel:** Shows the Global Environment, which is currently empty.
- Files Panel:** Shows the project structure with files like `.Rhistory`, `00_MRM_assignment_template.Rmd` (highlighted with a red arrow), and `data`.
- Console:** Displays the R startup message and license information.

Acknowledgements

Slides 2, 16-18 adapted from

<https://www.andrew.cmu.edu/user/achoulde/94842/>
by CC license

Slides 3-15; 19-20 adapted from

<https://github.com/rstudio-education/remaster-the-tidyverse/>
By CC license