

Integrating R

into your work with Rstudio and the tidyverse



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 swmpkim

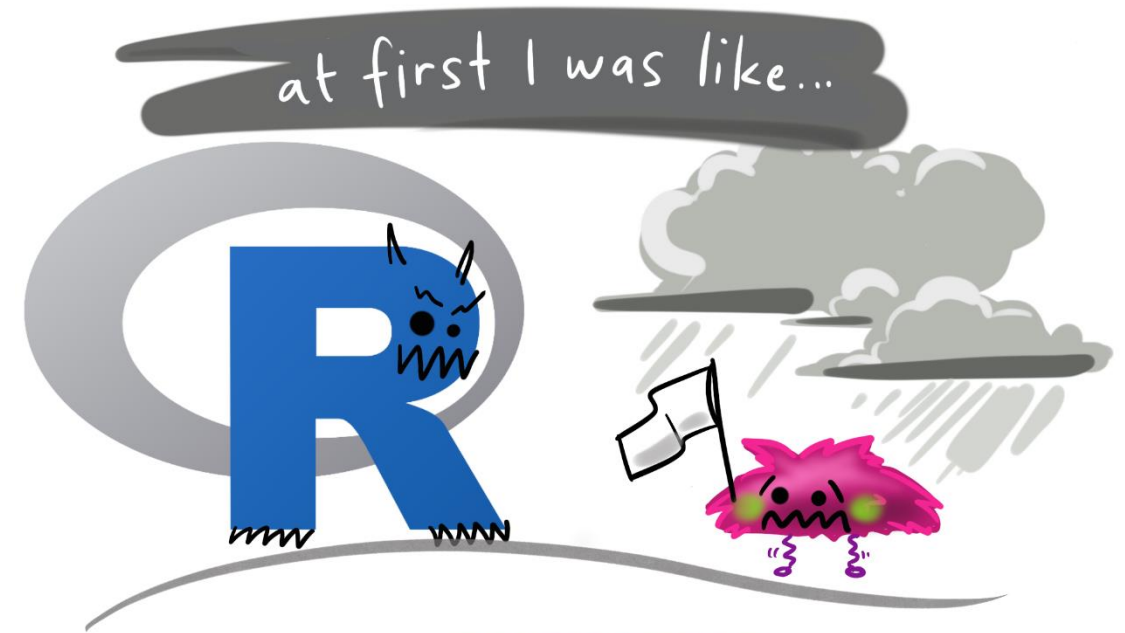


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Introduction



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



How today will go...

No sticky note: “I’m happily working on it”

Purple sticky note: “I’m all done and ready to move on”

Yellow sticky note: “I’m stuck. Send help!”
(or flag us down)

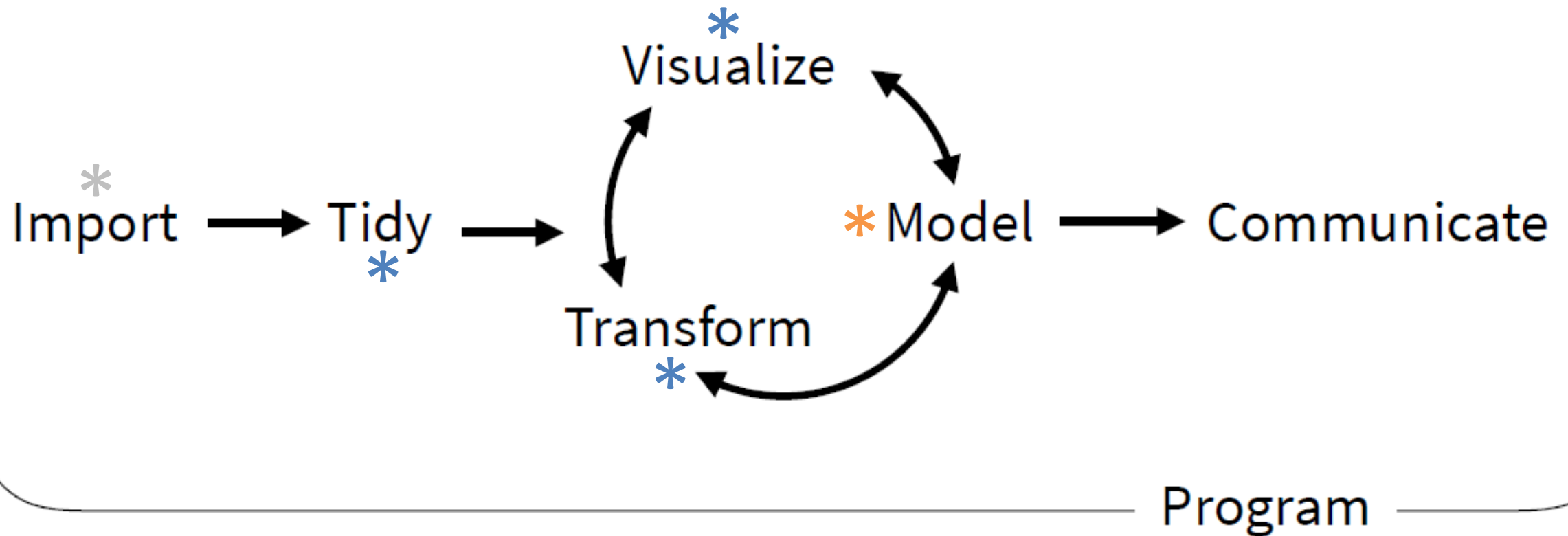


Image @cwickham

Agenda:

| Time | Day 1 | Day 2 |
|---------------|-------------------------------|---|
| 8:00 - 8:30 | Welcome, Intros, Objectives | Day 1 recap |
| 8:30 - 10:00 | Projects and RStudio | Functions and Loops |
| | Visualize Data, part 1 | |
| 10:00 - 10:30 | Morning Break | Morning Break |
| 10:30 - 12:00 | Visualize Data, part 2 | Statistical Output basics |
| | Wrangle Data, part 1 | |
| 12:00 - 13:00 | Lunch | Lunch |
| 13:00 - 14:00 | Wrangle Data, part 2 | Setting up projects and workflows |
| 14:00 - 15:00 | Reshape Data | Challenge, Wrap-up, work with your own data |
| 15:00 - 15:30 | Afternoon Break | Afternoon Break |
| 15:30 - 17:00 | Wrap-up, Questions, Challenge | Work with your own data |

(Applied) Data Science



Workflow Basics

Tips and tricks to making your R work more productive

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1. Save the source, not the workspace

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Workflow Basics:

Tips and tricks to making your R work more productive

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2. Use an IDE (integrated development environment), like RStudio
3. Project-oriented workflow
4. Use projects and the ``here`` package

here: find your PATH!



Workflow Basics:

Tips and tricks to making your R work more productive

1. Save the source, not the workspace
2. Use an IDE (integrated development environment), like RStudio
3. Project-oriented workflow
4. Use projects and the ``here`` package
5. Use standardized naming conventions

TL;DR - machine and human readable and plays well with default ordering (put something numeric first).

Left pad other numbers with zeros (to avoid the '10' coming before '01'). Avoid spaces in file names, punctuation, and accented characters.

Workflow Basics:

Tips and tricks to making your R work more productive

1. Save the source, not the workspace
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6. Coding review

`package::function()`

`<-`

Pipes! ``%>%`` from the ``magrittr`` package

Workflow Basics:

Tips and tricks to making your R work more productive

1. Save the source, not the workspace
2. Use an IDE (integrated development environment), like RStudio
3. Project-oriented workflow
4. Use projects and the `here` package
5. Use standardized naming conventions
6. Coding review
7. Keyboard Shortcuts: there's an RStudio Cheatsheet for that!

We love:

alt+- :for <-
ctrl+enter :to run one or more lines
ctrl+shift+m :for %>%
ctrl+shift+c :to
comment/uncomment
ctrl+i :to indent prettily

RStudio IDE : : CHEAT SHEET

Documents and Apps

Annotations for Documents and Apps pane:

- Open Shiny, R Markdown, knitr, Sweave, LaTeX, Rd files and more in Source Pane
- Check spelling
- Render output
- Choose output format
- Choose output location
- Insert code chunk
- Jump to previous chunk
- Jump to next chunk
- Run selected lines
- Publish to server
- Show file outline
- Access markdown guide at **Help > Markdown Quick Reference**
- Jump to Set knitr chunk options
- Run this and all previous code chunks
- Run this code chunk
- RStudio recognizes that files named **app.R**, **server.R**, **ui.R**, and **global.R** belong to a shiny app
- Run app
- Choose location to shinyapps.io view app
- Publish to shinyapps.io or server
- Manage publish accounts

Debug Mode

Annotations for Debug Mode:

- Open with **debug()**, **browse()**, or a breakpoint. RStudio will open the debugger mode when it encounters a breakpoint while executing code.
- Click next to line number to add/remove a breakpoint.
- Highlighted line shows where execution has paused.
- Run commands in environment where execution has paused.
- Examine variables in executing environment.
- Select function in traceback to debug.
- Step through code one line at a time.
- Step into and out of functions to run.
- Resume debug execution mode.
- Quit debug mode.



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Write Code

Annotations for Write Code pane:

- Navigate tabs
- Open in new window
- Save
- Find and replace
- Compile as notebook
- Run selected code
- Import data with wizard
- History of past commands to run/copy
- Display RPres slideshows
- File > New File > R Presentation**
- Load workspace
- Save workspace
- Delete all saved objects
- Search inside environment
- Display objects as list or grid
- Multiple cursors/column selection with **Alt+mouse drag**
- Code diagnostics that appear in the margin. Hover over diagnostic symbols for details.
- Syntax highlighting based on your file's extension
- Tab completion to finish function names, file paths, arguments, and more.
- Multi-language code snippets to quickly use common blocks of code.
- Jump to function in file
- Change file type
- Working Directory
- Maximize, minimize panes
- Press **Alt+H** to see command history
- Drag pane boundaries

R Support

Annotations for R Support pane:

- Displays saved objects by type with short description
- View in data viewer
- View function source code
- GUI Package manager lists every installed package
- Click to load package with **library()**. Unlick to detach package with **detach()**
- Click on file or directory name to open.

Version Control with Git or SVN

Annotations for Version Control pane:

- Turn on at **Tools > Project Options > Git/SVN**
- Stage files
- Show file diff
- Commit staged files
- Push/Pull staged files to remote
- View History
- Home page of helpful links
- Search within help file
- Search for help file
- Viewer Pane displays HTML content, such as Shiny R Markdown reports, and interactive visualization
- Stop Shiny app
- Publish to shinyapps.io, rpubs, RSCONnect, ...
- Rel

Package Writing

Annotations for Package Writing pane:

- File > New Project > New Directory > R Package**
- Turn project into package.
- Enable roxygen documentation with **Tools > Project Options > Build Tools**
- Roxygen guide at **Help > Roxygen Quick Reference**

Pro Features

Annotations for Pro Features pane:

- Share Project with Collaborators
- Active shared collaborators
- Start new R Session in current project
- Close R Session in project
- Select R Version
- PROJECT SYSTEM**
- File > New Project**
- RStudio saves the call h workspace, and working directory associated with project. It reloads each you re-open a project.

1 LAYOUT

Move focus to Source Editor
Move focus to Console
Move focus to Help
Show History
Show Files
Show Plots
Show Packages
Show Environment
Show Git/SVN
Show Build

2 RUN CODE

Search command history
Navigate command history
Move cursor to start of line
Move cursor to end of line
Change working directory
Interrupt current command
Clear console
Quit Session (desktop only)
Restart R Session
Run current line/selection
Run current (retain cursor)
Run from current to end
Run the current function
Source a file
Source the current file
Source with echo

3 NAVIGATE CODE

Goto File/Function
Fold Selected
Unfold Selected
Fold All
Unfold All
Go to line
Jump to
Switch to tab
Previous tab
Next tab
Last tab
Navigate back
Navigate forward
Jump to Brace
Select within Braces
Use Selection for Find
Find in Files
Find Next
Find Previous
Jump to Word
Jump to Start/End
Toggle Outline

Windows/Linux

Ctrl+1
Ctrl+2
Ctrl+3
Ctrl+4
Ctrl+5
Ctrl+6
Ctrl+7
Ctrl+8
Ctrl+9
Ctrl+0

Mac

Ctrl+1
Ctrl+2
Ctrl+3
Ctrl+4
Ctrl+5
Ctrl+6
Ctrl+7
Ctrl+8
Ctrl+9
Ctrl+0

Windows/Linux

Ctrl+1
Alt+L
Alt+O
Shift+Alt+O
Shift+Alt+G
Ctrl+Shift+L
Ctrl+Shift+F11
Ctrl+Shift+F12
Ctrl+F9
Ctrl+F10
Ctrl+P
Ctrl+Shift+Alt+E
Ctrl+F3
Ctrl+Shift+F
Win: F3, Linux: Ctrl+G
W: Shift+F3, L: Ctrl+Shift+O

4 WRITE CODE

Attempt completion
Navigate candidates
Accept candidate
Dismiss candidates
Undo
Redo
Cut
Copy
Paste
Select All
Delete Line
Select
Select Word
Select to Line Start
Select to Line End
Shift+Page Up/Down
Select to Start/End
Delete Word Left
Delete Word Right
Delete to Line End
Delete to Line Start
Indent
Outdent
Yank line up to cursor
Yank line after cursor
Insert yanked text
Insert %>%
Show help for function
Show source code
New document
New document (Chrome)
Open document
Save document
Close document
Close all documents
Extract variable
Extract function
Reindent lines
Close document (Chrome)

Mac

Cmd+1
Cmd+Option+L
Cmd+Shift+Option+L
Cmd+Option+O
Cmd+Shift+Option+O
Cmd+Shift+Option+G
Cmd+Shift+Option+J
Ctrl+Shift+.
Ctrl+F11
Ctrl+F12
Ctrl+Shift+F11
Ctrl+Shift+F12
Cmd+F9
Cmd+F10
Ctrl+P
Ctrl+Shift+Option+E
Cmd+E
Cmd+Shift+F
Cmd+G
Cmd+Shift+G
Option+↵
Cmd+↵
Cmd+Shift+O

Windows/Linux

Tab or Ctrl+Space
Enter, Tab, or →
Esc
Ctrl+Z
Ctrl+Shift+Z
Ctrl+X
Ctrl+C
Ctrl+V
Ctrl+A
Ctrl+D
Shift+[Arrow]
Ctrl+Shift+↵
Alt+Shift+↵
Shift+Page Up/Down
Shift+Alt+↵
Ctrl+Backspace
Option+Delete
Option+Backspace
Tab (at start of line)
Shift+Tab
Ctrl+U
Ctrl+K
Ctrl+Y
Alt+
Ctrl+Shift+M
F1
F2
Ctrl+Shift+N
Ctrl+Alt+Shift+N
Ctrl+O
Ctrl+S
Ctrl+W
Ctrl+Alt+W
Ctrl+Shift+W
Ctrl+Alt+X
Ctrl+Alt+V
Ctrl+I
Ctrl+Shift+C
Ctrl+Shift+/

Mac

Tab or Cmd+Space
Enter, Tab, or →
Esc
Cmd+Z
Cmd+Shift+Z
Cmd+X
Cmd+C
Cmd+V
Cmd+A
Cmd+D
Shift+[Arrow]
Option+Shift+↵
Cmd+Shift+↵
Cmd+Shift+↵
Cmd+Shift+↵
Ctrl+Opt+Backspace
Option+Delete
Option+Backspace
Tab (at start of line)
Shift+Tab
Ctrl+U
Ctrl+K
Ctrl+Y
Option+
Cmd+Shift+M
F1
F2
Cmd+Shift+N
Cmd+Shift+Opt+N
Cmd+O
Cmd+S
Cmd+W
Cmd+Option+W
Cmd+Shift+W
Cmd+Option+X
Cmd+Option+V
Cmd+I
Cmd+Shift+C
Cmd+Shift+/

Windows/Linux

Ctrl+Shift+K
Ctrl+Shift+K
Ctrl+Shift+K
Ctrl+Alt+I
Ctrl+Shift+R
Ctrl+Shift+P
Ctrl+Alt+R
Ctrl+Alt+B
Ctrl+Alt+T
Ctrl+Alt+P
Ctrl+Alt+C
Ctrl+Alt+N
Ctrl+F8
Ctrl+Alt+F11
Ctrl+Alt+F12
Alt+Shift+K

Mac

Cmd+Shift+K
Cmd+Shift+K
Cmd+Shift+K
Cmd+Option+I
Cmd+Shift+P
Cmd+Shift+P
Cmd+Option+R
Cmd+Option+B
Cmd+Option+T
Cmd+Option+P
Cmd+Option+C
Cmd+Option+N
Cmd+F8
Cmd+Option+F11
Cmd+Option+F12
Option+Shift+K

WHY RSTUDIO SERVER PRO?

RSP extends the the open source server with a commercial license, support, and more:

- open and run multiple R sessions at once
- tune your resources to improve performance
- edit the same project at the same time as others
- see what you and others are doing on your server
- switch easily from one version of R to a different version
- integrate with your authentication, authorization, and audit practices

Download a free 45 day evaluation at www.rstudio.com/products/rstudio-server-pro/

5 DEBUG CODE

Toggle Breakpoint
Execute Next Line
Step Into Function
Finish Function/Loop
Continue
Stop Debugging

6 VERSION CONTROL

Show diff
Commit changes
Scroll diff view
Stage/Unstage (Git)
Stage/Unstage and move to next

7 MAKE PACKAGES

Build and Reload
Load All (devtools)
Test Package (Desktop)
Test Package (Web)
Check Package
Document Package

8 DOCUMENTS AND APPS

Preview HTML (Markdown, etc.)
Knit Document (knitr)
Compile Notebook
Compile PDF (Text and Sweave)
Insert chunk (Sweave and Knitr)
Insert code section
Re-run previous region
Run current document
Run from start to current line
Run the current code section
Run previous Sweave/Rmd code
Run the current chunk
Run the next chunk
Sync Editor & PDF Preview
Previous plot
Next plot
Show Keyboard Shortcuts

Windows/Linux

Ctrl+Shift+K
Ctrl+Shift+K
Ctrl+Shift+K
Ctrl+Alt+I
Ctrl+Shift+R
Ctrl+Shift+P
Ctrl+Alt+R
Ctrl+Alt+B
Ctrl+Alt+T
Ctrl+Alt+P
Ctrl+Alt+C
Ctrl+Alt+N
Ctrl+F8
Ctrl+Alt+F11
Ctrl+Alt+F12
Alt+Shift+K

Mac

Cmd+Shift+K
Cmd+Shift+K
Cmd+Shift+K
Cmd+Option+I
Cmd+Shift+P
Cmd+Shift+P
Cmd+Option+R
Cmd+Option+B
Cmd+Option+T
Cmd+Option+P
Cmd+Option+C
Cmd+Option+N
Cmd+F8
Cmd+Option+F11
Cmd+Option+F12
Option+Shift+K



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Write Code

Navigate tabs

Open in new window

Save

Find and replace

Compile as notebook

Run selected code

```
1 # Good Start...
2
3
4
5
6 "P0030001"
7 "P0030002"
8 "P0030003"
9 "P0030004"
10
11
12 get_digit <- function() {
13   ("num" %% (10 ^ n))
14   %/% (10 ^ (n - 1))
15 }
16
17 fo
18   for {snippet}
19     foo {GlobalEnv}
20     force {base}
21
22
```

Cursors of shared users

Re-run previous code

Source with or without Echo

Show file outline

Multiple cursors/column selection with **Alt + mouse drag**.

Code diagnostics that appear in the margin. Hover over diagnostic symbols for details.

Syntax highlighting based on your file's extension

Tab completion to finish function names, file paths, arguments, and more.

Multi-language code snippets to quickly use common blocks of code.

Jump to function in file

Change file type

```
~/IDEcheatsheet/
> foo(1)
[1] 2
> foo <- function(x) x + 1
> foo(2)
[1] 3
> foo(2)
[1] 3
> foo(1)
[1] 2
```

Working Directory

Press **↑** to see command history

Maximize, minimize panes

Drag pane boundaries

R Support

Import data with wizard

History of past commands to run/copy

Display .RPres slideshows
File > New File > R Presentation

Environment History Build Git Presentation

Load workspace Save workspace Delete all saved objects Search inside environment

Choose environment to display from list of parent environments Display objects as list or grid

| Data | |
|-----------|-------------------------|
| iris | 150 obs. of 5 variables |
| Values | |
| a | 1 |
| Functions | |
| foo | function (x) |

Displays saved objects by type with short description View in data viewer View function source code

Files Plots Packages Help Viewer

New Folder Upload Delete Rename More

Home IDEcheatsheet

Name

Create folder Upload file Delete file Rename file

Copy... Move... Export... Set As Working Directory Go To Working Directory Change directory

Path to displayed directory

..

hello.R 19 B Apr 13, 2016, 11:17 AM

A File browser keyed to your working directory. Click on file or directory name to open.

Documents and Apps

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

Check spelling Render output Choose output format Choose output location Insert code chunk

Jump to previous chunk Jump to next chunk Run selected lines Publish to server Show file outline

Access markdown guide at **Help > Markdown Quick Reference**

Jump to chunk Set knitr chunk options Run this and all previous code chunks Run this code chunk

```
17- ```{r pressure, echo=FALSE}
18- plot(pressure)
19- ```
20-
```

15:1 (Top Level) R Markdown

Rmarkdown

TEXT.CODE.OUTPUT.
(GET IT TOGETHER, PEOPLE.)



"Data comes in many formats, but R prefers just one: tidy data. "

- Garrett Grolemund

Tidy data

| country | year | cases | pop |
|-------------|------|-------|-------|
| Afghanistan | 1999 | 745 | 19987 |
| Algeria | 1999 | 161 | 29123 |
| Brazil | 1999 | 151 | 17102 |
| China | 1999 | 239 | 12102 |
| China | 2000 | 247 | 12654 |

A data set is **tidy** if:

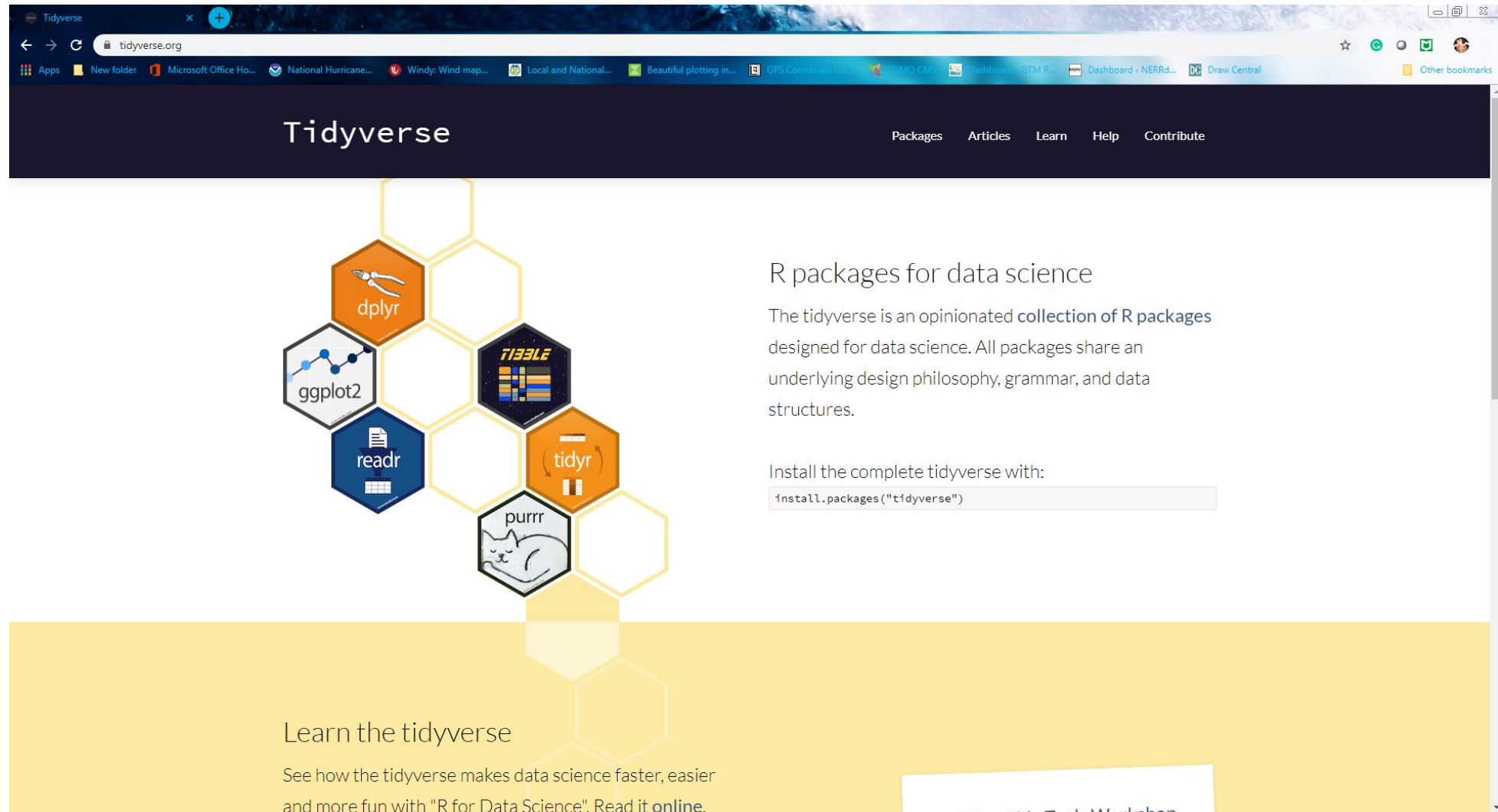
1. Each **variable** is in its own **column**
2. Each **observation** is in its own **row**
3. Each **value** is in its own **cell**

Also see these papers, in your “other resources” folder:

Wickham, 2014: *Tidy Data*

Broman and Woo, 2017: *Data Organization in Spreadsheets*

www.tidyverse.org



The screenshot shows the homepage of tidyverse.org. At the top is a dark blue navigation bar with the 'Tidyverse' logo on the left and links for 'Packages', 'Articles', 'Learn', 'Help', and 'Contribute' on the right. Below the navigation bar, on the left, is a cluster of hexagonal icons representing various R packages: dplyr (orange with a bird), ggplot2 (grey with a network diagram), readr (blue with a document), purrr (grey with a cat), tidyr (orange with a puzzle piece), and tibble (dark blue with a grid). To the right of these icons, the text reads 'R packages for data science' followed by a paragraph: 'The tidyverse is an opinionated collection of R packages designed for data science. All packages share an underlying design philosophy, grammar, and data structures.' Below this is a section titled 'Install the complete tidyverse with:' with a code box containing `install.packages("tidyverse")`. At the bottom, a yellow banner contains the text 'Learn the tidyverse' and 'See how the tidyverse makes data science faster, easier and more fun with "R for Data Science". Read it online.'

Tidyverse

Packages Articles Learn Help Contribute

R packages for data science

The tidyverse is an opinionated collection of R packages designed for data science. All packages share an underlying design philosophy, grammar, and data structures.

Install the complete tidyverse with:

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

Learn the tidyverse

See how the tidyverse makes data science faster, easier and more fun with "R for Data Science". Read it online.