



# RSTUDIO OVERVIEW

A screenshot of the R Studio interface. The top menu bar includes File, Edit, Code, View, Plots, Session, Build, Debug, Tools, and Help. The main area shows an R script titled "chicagoFood.R" with the following code:

```
1 url <- "http://data.cityofchicago.org/api/views/4ijn-s7e5/rows.csv?c=&q=&method=export&format=csv"
2 data <- read.csv(url, header = TRUE) # takes a minute...
3 names(data) <- tolower(names(data))
4 data1 <- subset(data, risk %in% c("Risk 1 (High)", "Risk 2 (Medium)", "Risk 3 (Low)"))
5 data1$risk <- droplevels(data1$risk)
6
7 data1 <- data1[1:50,]
8 library(leaflet)
9 leaflet(data1) %>%
10   addTiles() %>%
11   addMarkers(lat = ~latitude, lng = ~longitude)
```

The console window below shows the same R code being run. To the right, the "Environment" tab of the sidebar shows two data objects: "data" (118607 obs. of 17 variables) and "data1" (50 obs. of 17 variables). The "Plots" tab contains a map of Chicago with numerous blue location pins. The map shows various neighborhoods like Ridge, Lincolnwood, Norridge, Park, Elmwood, and Maywood, with roads labeled IL 39A, IL 41B, IL 80, IL 81A, IL 82B, IL 42, IL 83B, IL 84, IL 45B, IL 47A, IL 47B, IL 50, IL 64, IL 49A, IL 50B, and US 41.

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# SAFE HARBOR

This presentation is confidential and intended for existing and prospective customers of RStudio. It may not be distributed to others without permission.

Any future plans are best guesses and may change at any time due to market conditions. Nothing in this presentation should be construed as a commitment.

# Fannie Mae ML Workshop

RStudio & Setup	1:30 - 1:40
Afternoon Break	2min
Transforming Data & Data Visualization	1:42 - 1:55
Afternoon Break	5min
Intro to Landscape for ML in R	2:00 - 2:50
Afternoon break	5min
Shiny & RMD	2:55 - 3:20
Afternoon break & Q/Z	10min

**HELLO**  
my name is

Nathan

**HELLO**  
my name is

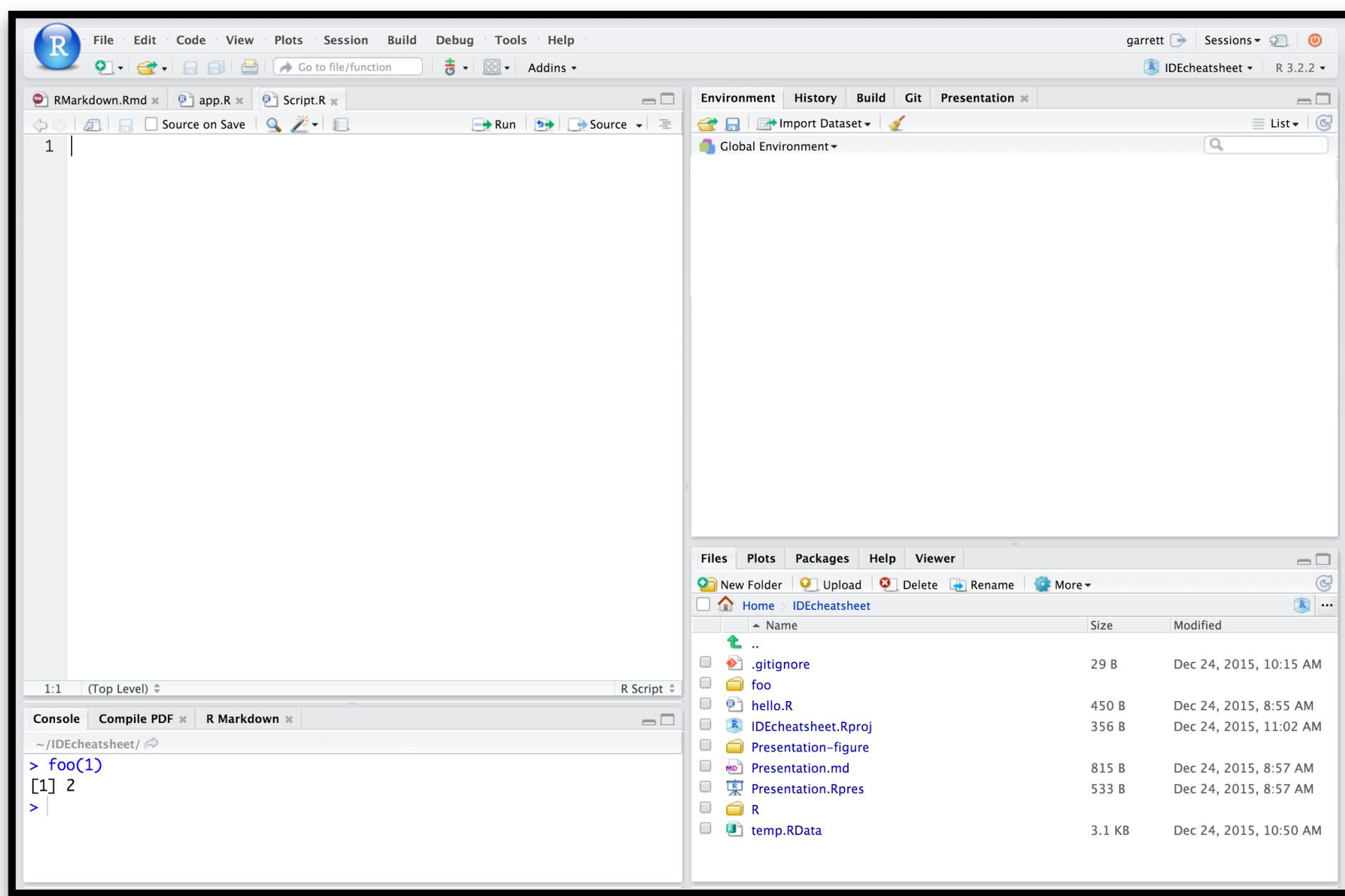
**Jonathan**

**HELLO**  
my name is

**Phil**

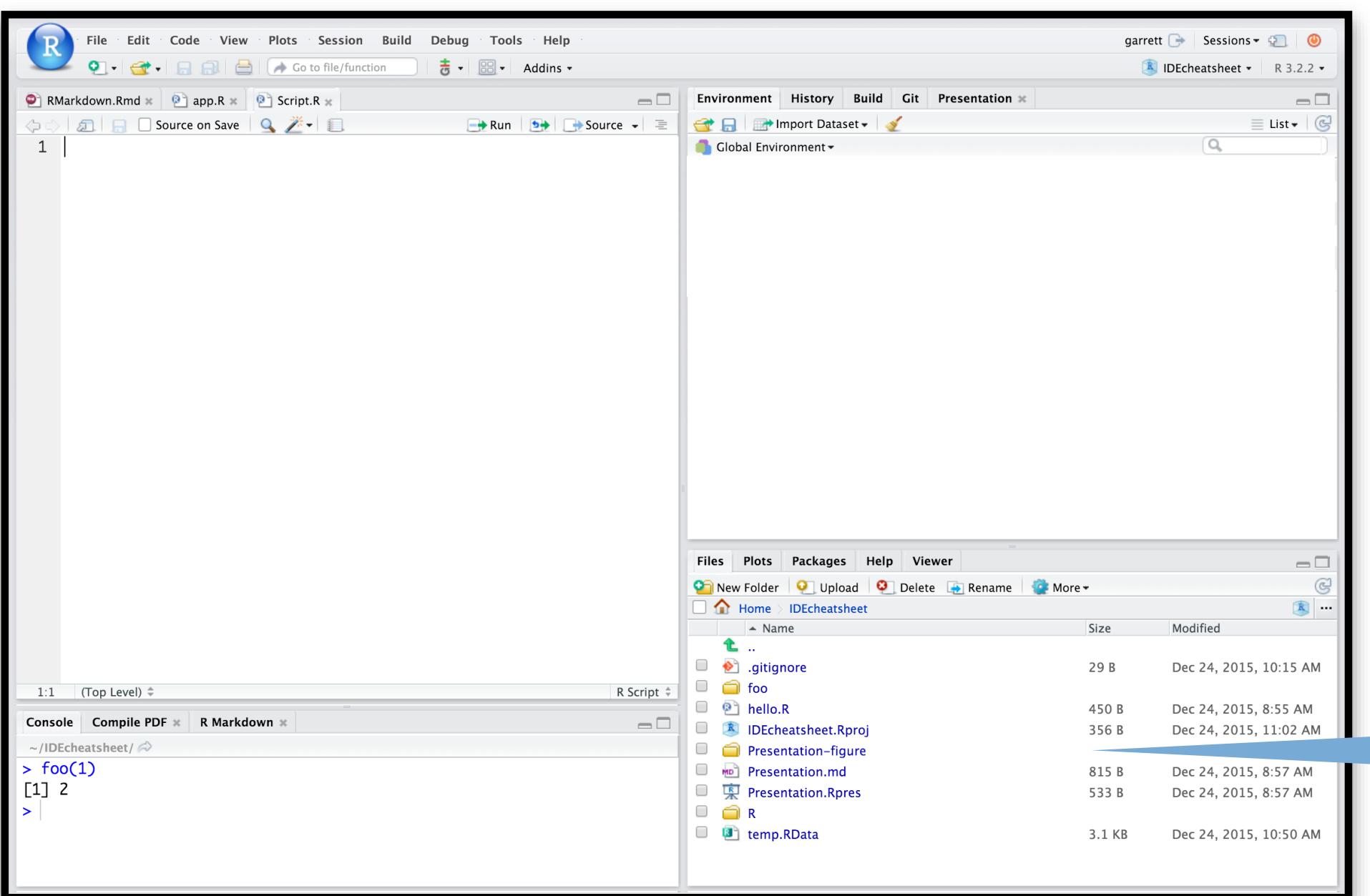
# Course Info

Collect a login card. Then login to the class server.



# Course Info

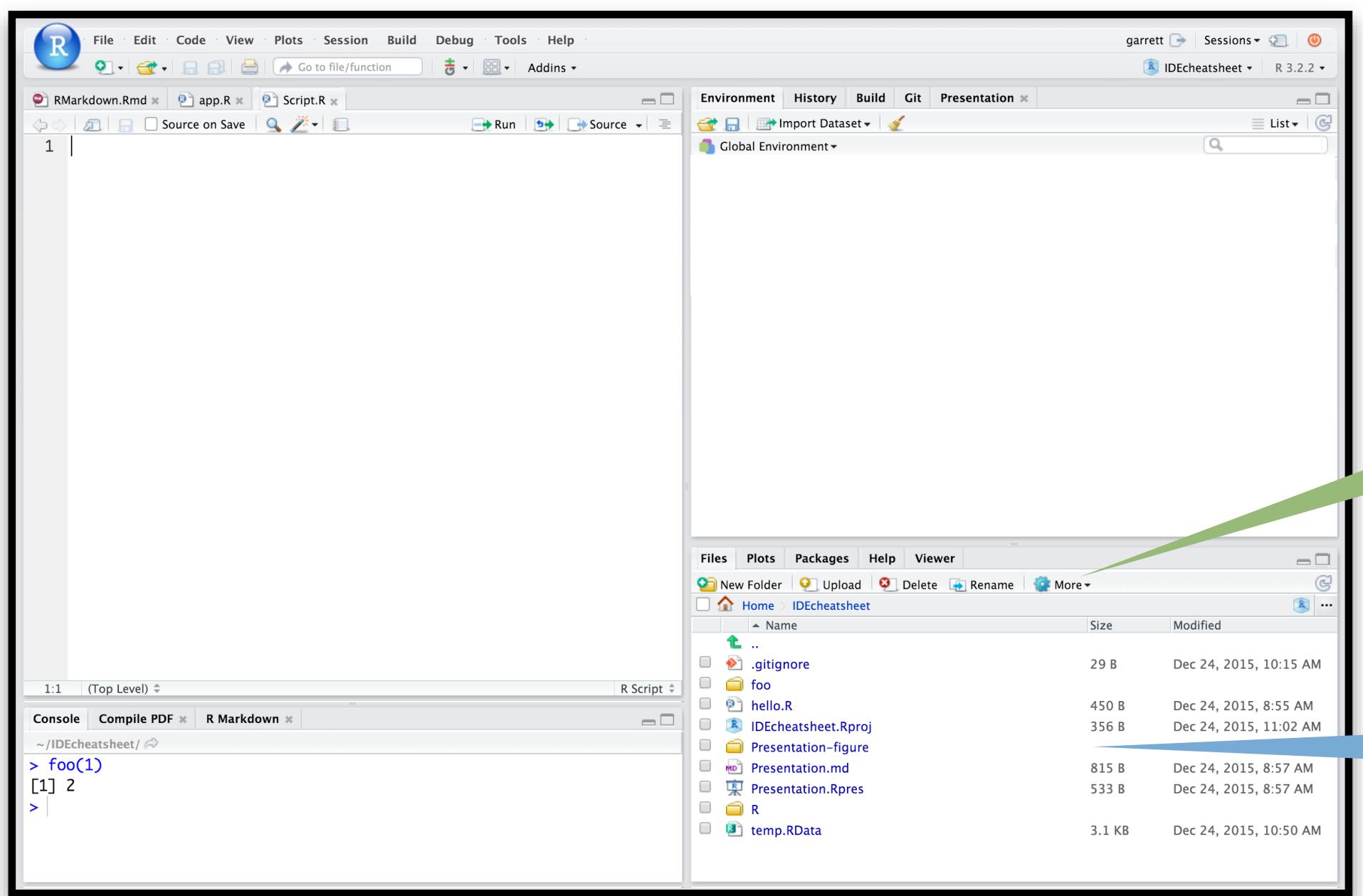
Collect a login card. Then login to the class server.



File Browser  
manage scripts

# Course Info

Collect a login card. Then login to the class server.



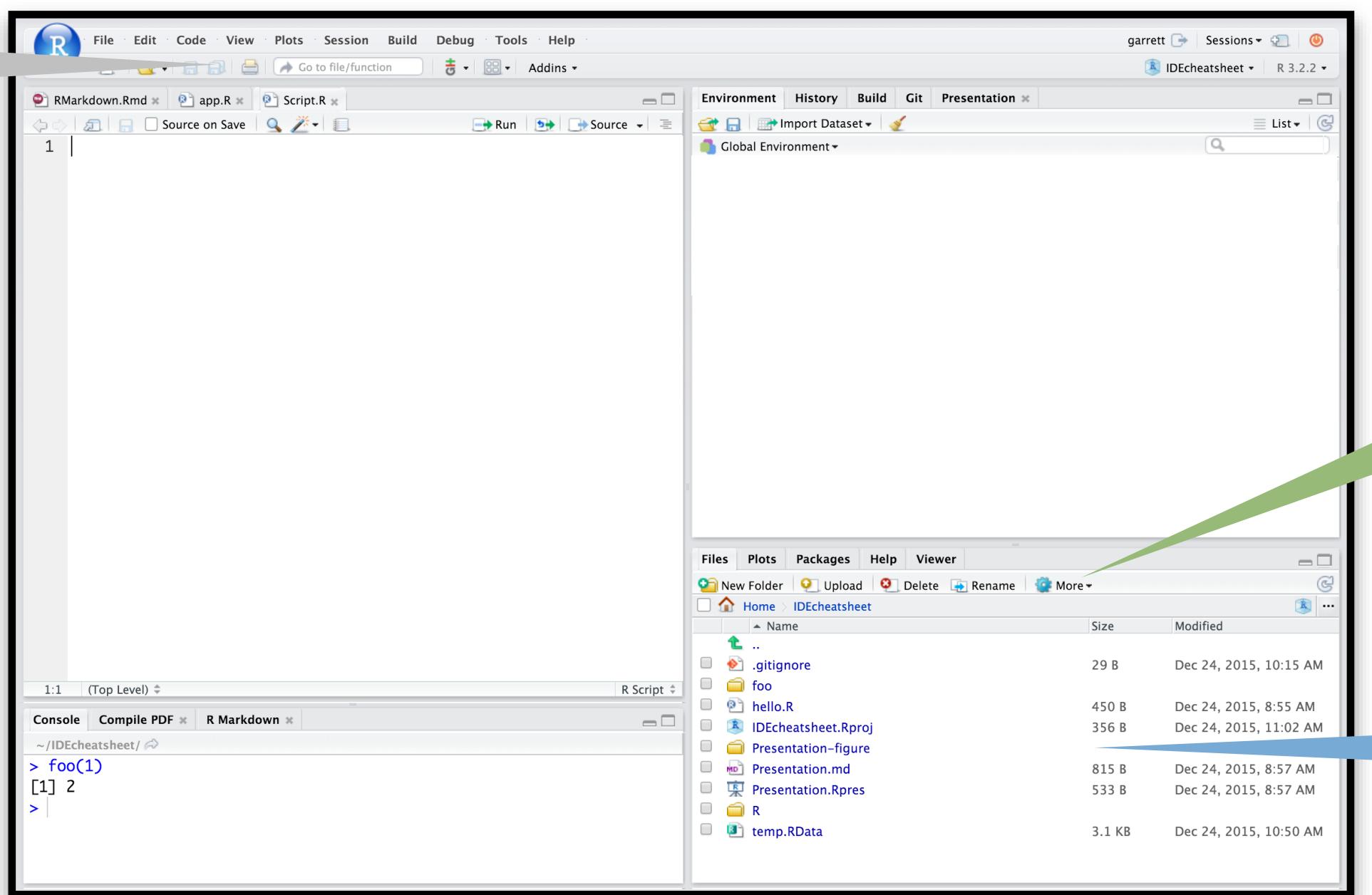
Download class files  
with **More > Export**

File Browser  
to manage scripts

# Course Info

Collect a login card. Then login to the class server.

Scripts Pane to  
compose R code.  
Open with  
File > New.

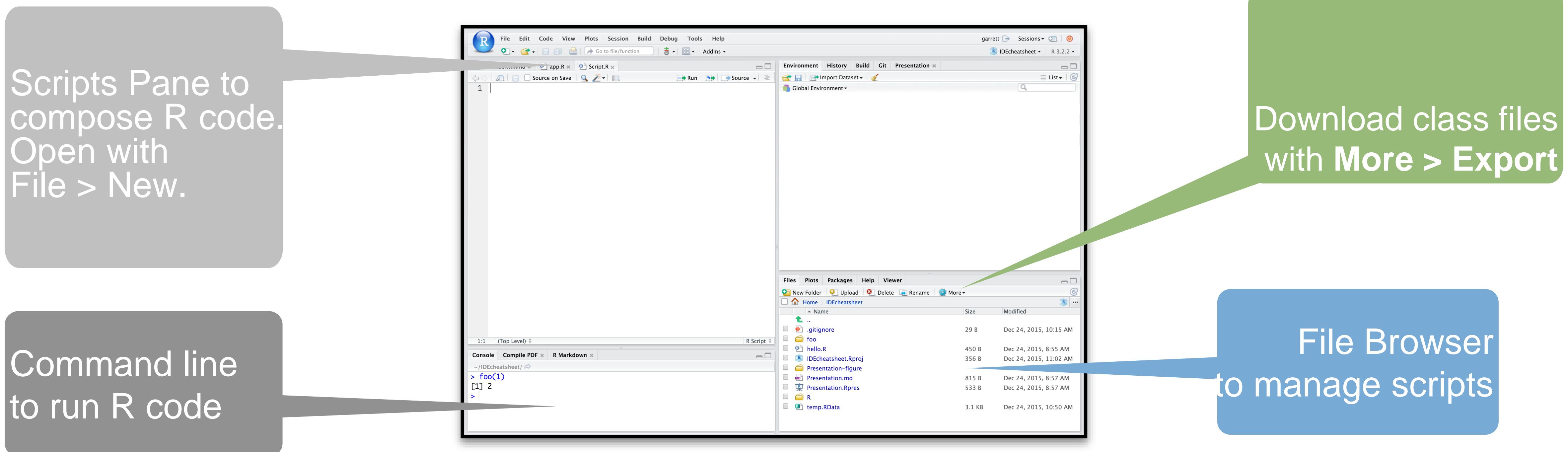


Download class files  
with **More > Export**

File Browser  
to manage scripts

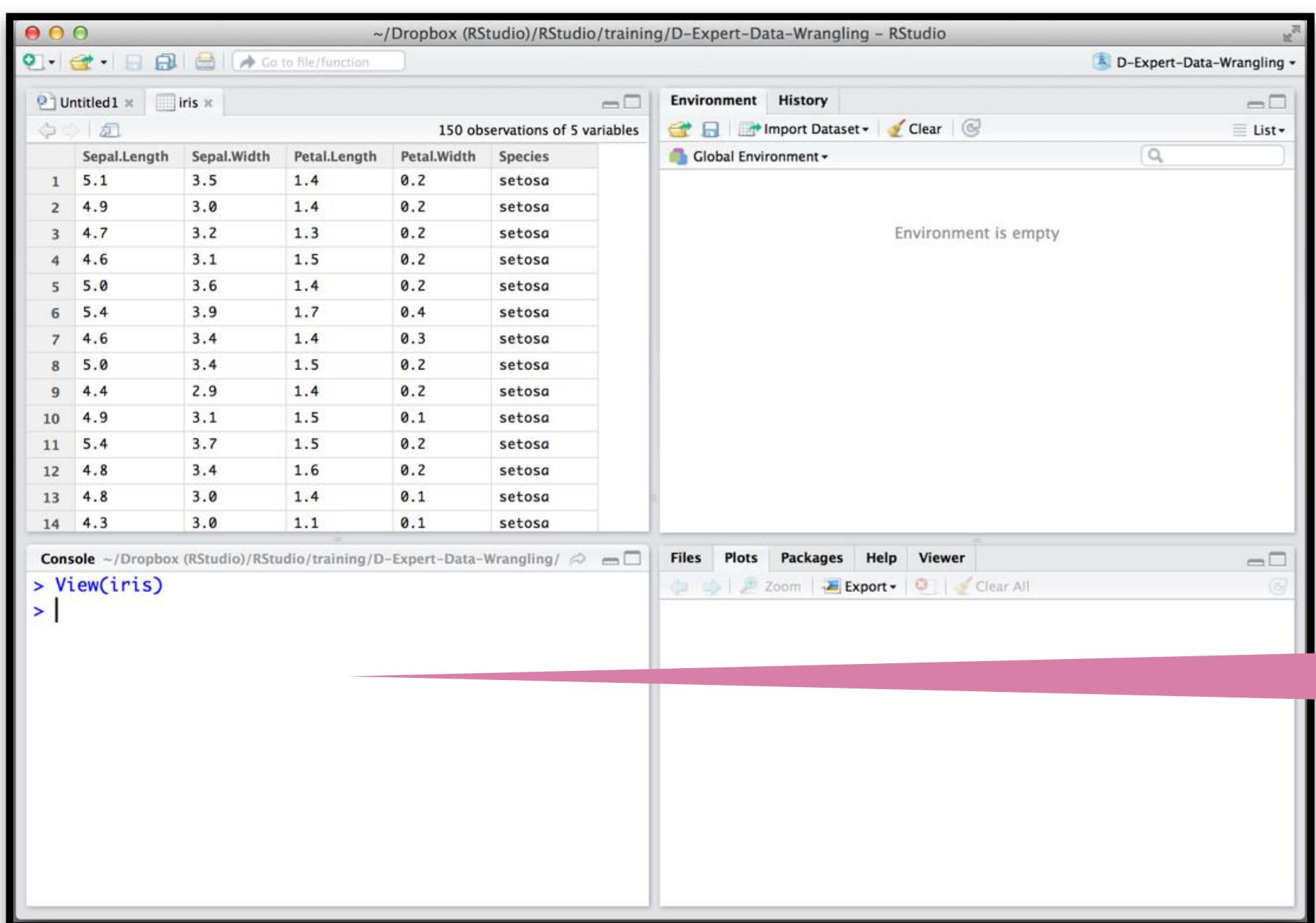
# Course Info

Collect a login card. Then login to the class server.



# Course Info

Collect a login card. Then login to the class server.



	Sepal.Length	Sepal.Width	Petal.Length	Petal.Width	Species
1	5.1	3.5	1.4	0.2	setosa
2	4.9	3.0	1.4	0.2	setosa
3	4.7	3.2	1.3	0.2	setosa
4	4.6	3.1	1.5	0.2	setosa
5	5.0	3.6	1.4	0.2	setosa
6	5.4	3.9	1.7	0.4	setosa
7	4.6	3.4	1.4	0.3	setosa
8	5.0	3.4	1.5	0.2	setosa
9	4.4	2.9	1.4	0.2	setosa
10	4.9	3.1	1.5	0.1	setosa
11	5.4	3.7	1.5	0.2	setosa
12	4.8	3.4	1.6	0.2	setosa
13	4.8	3.0	1.4	0.1	setosa
14	4.3	3.0	1.1	0.1	setosa

? to open  
help page,  
e.g. ?iris

*Enabling the human  
desire to understand  
and improve the world  
through data analysis*

# WHAT WE DO

- Build and promote software that supports **reproducible** data analysis
  - Primary focus is **usability** in our interfaces and APIs
  - Open-source products have become the **de facto standards** for R statistical programming
- Our tools are not for everyone, but they are **available to everyone** (Like R itself)
  - 70% of our engineering effort is towards open source: RStudio, Shiny, R Markdown, dplyr, etc.
  - The essential parts of our stack must be **open source**
- Achieve a sustainable business model, primarily from commercially-licensed versions of our servers
  - Helpful features in our Pro products for: Security, Scalability, Manageability, Auditing, Deployment, Collaboration, etc
  - **If you've licensed our Pro products, thank you for supporting us!**

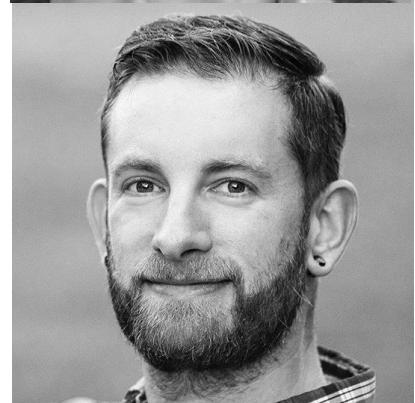
# WHO WE ARE



J.J. Allaire  
Founder & CEO



Tareef Kawaf  
President



Hadley Wickham  
Chief Scientist



Joe Cheng  
Chief Technology Officer

ebay™

Lilly

AstraZeneca

agios

Google

Boehringer  
Ingelheim

Allianz

zapier\*

waze  
OUTSMARTING TRAFFIC, TOGETHER

DTCC

STITCH FIX™

Boehringer  
Ingelheim

edf

Medtronic

NASA

Erie  
Insurance®

AMGEN

Roche

R Studio®

- Founded in 2008 with the aim of making a distinctive and durable contribution to software for data analysis
- Initial open-source products became the de facto standards for R statistical programming
- Commercial products introduced in 2013 allow adoption at scale on the web or within organizations

# What is R?

- Open source software environment for statistical computing and graphics
- Created over 20 years ago by two statistics professors in New Zealand
- Based on S, a similar environment originally developed at AT&T Bell Labs



# Why R?

- It's free, open source, and available on every major platform. As a result, if you do your analysis in R, anyone can easily replicate it.
- A massive set of packages for statistical modelling, machine learning, visualization, and importing and manipulating data.
- Cutting edge tools - a powerful and flexible toolkit which allows you to write concise yet descriptive code.
- A fantastic community.
- Powerful tools for communicating your results...Data Products

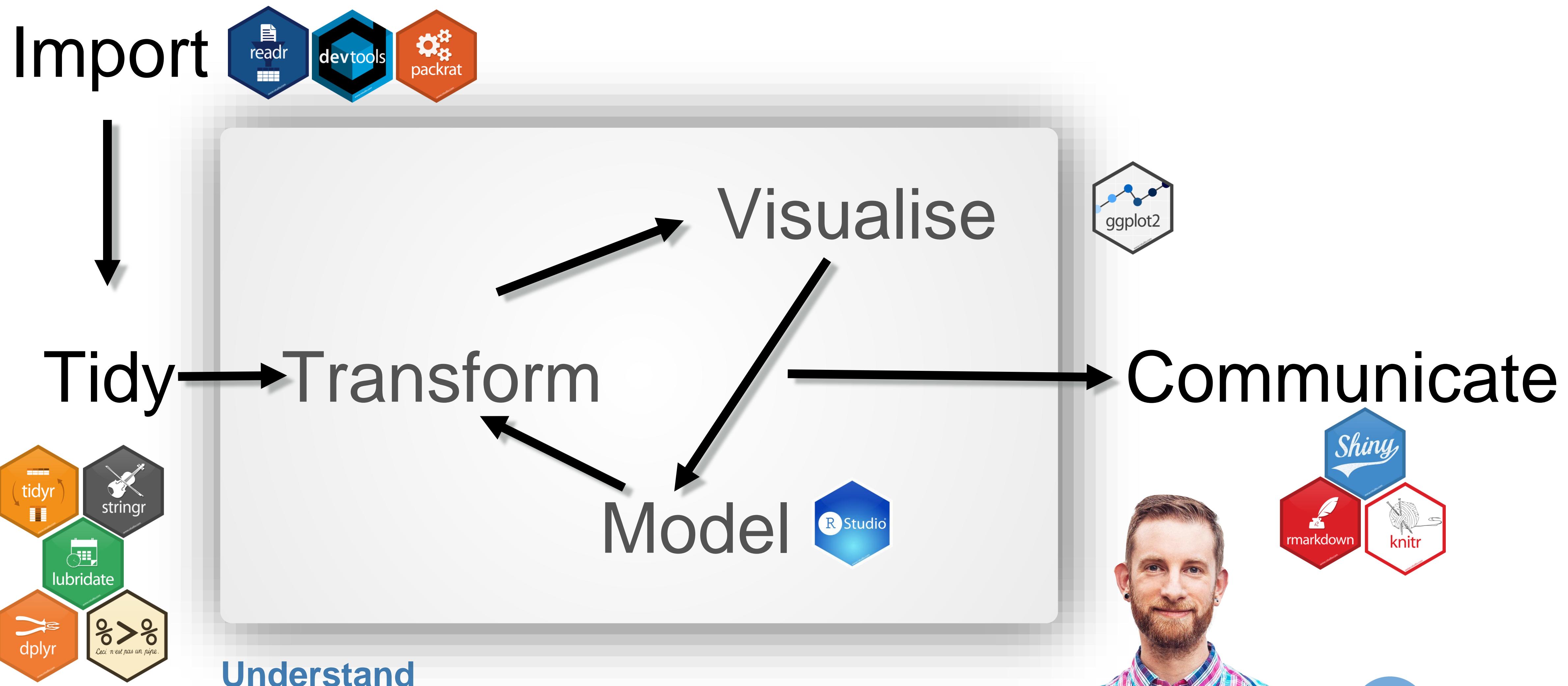


# FREE & OPEN SOURCE R PACKAGES

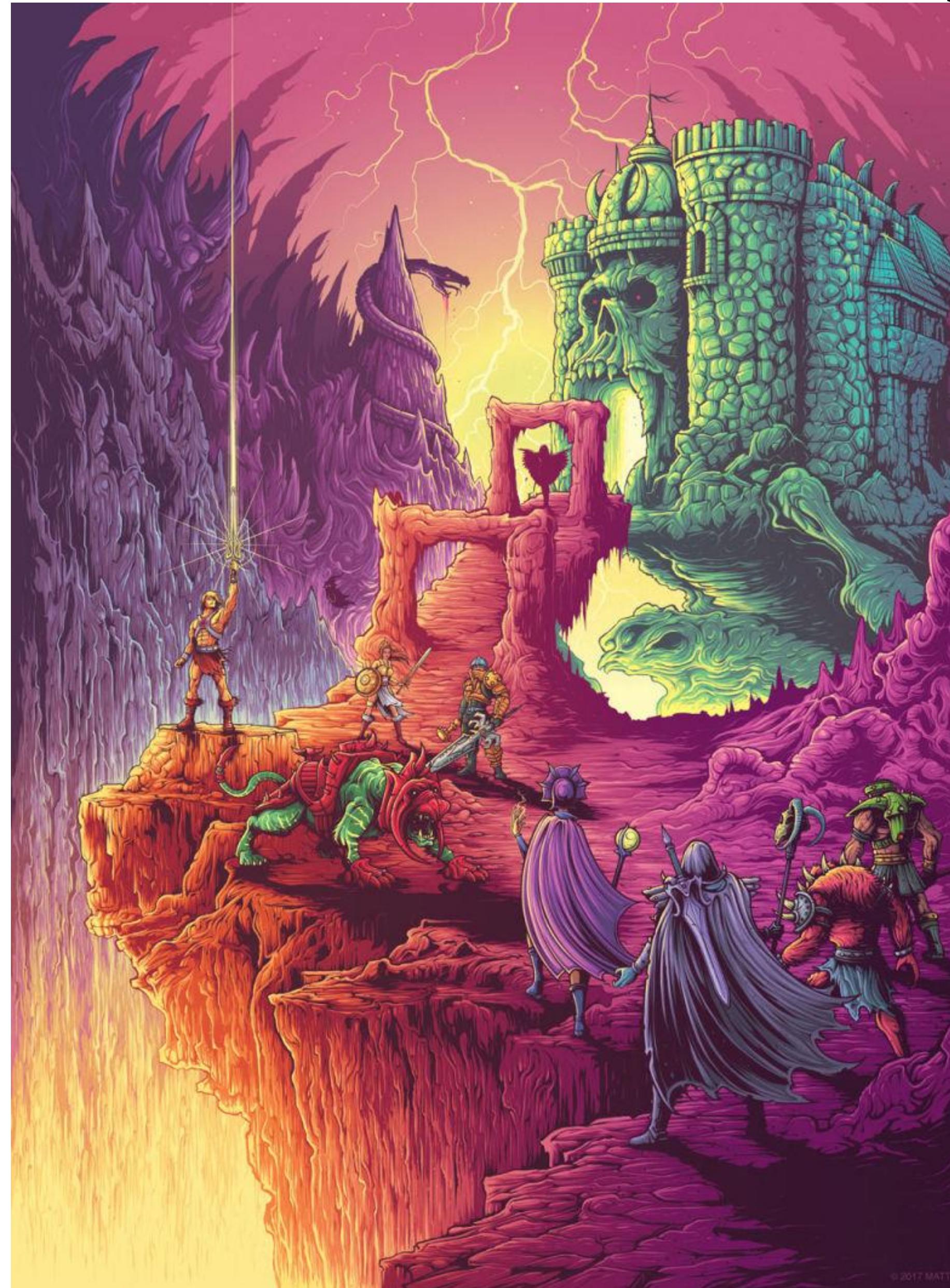
- RStudio employees contribute extensively to the R community
- This includes the most widely used and newest open-source libraries for data manipulation (plyr and dplyr), data visualization (ggplot2 and ggvis), and publishing (knitr, R Markdown...)
- RStudio packages provide powerful productivity tools for R (packrat, devtools, roxygen2, testthat)
- Next generation of interactive web enabled graphics for R



# HOW WE THINK ABOUT DATA SCIENCE



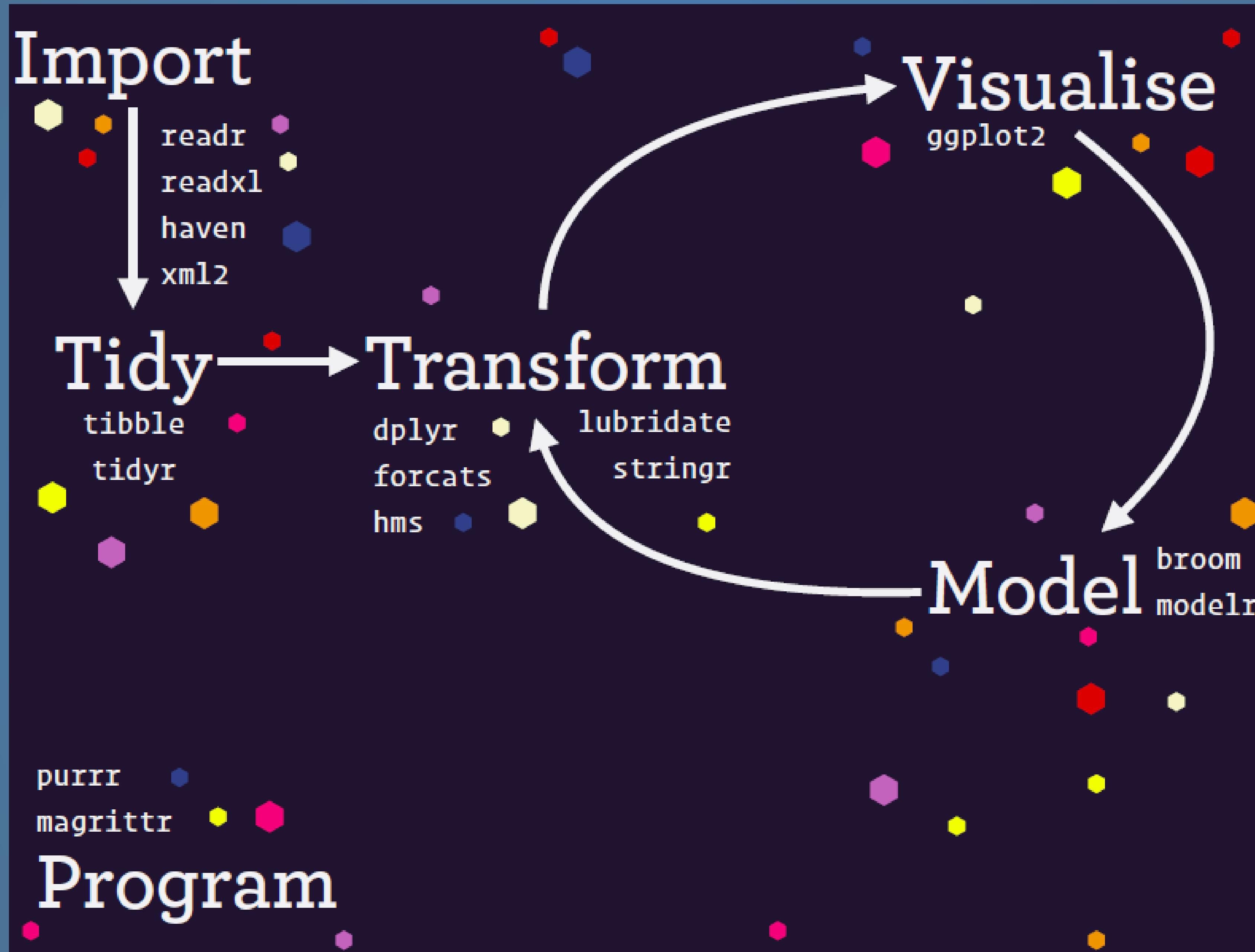
# Masters of the Tidyverse



Art by Dan Mumford

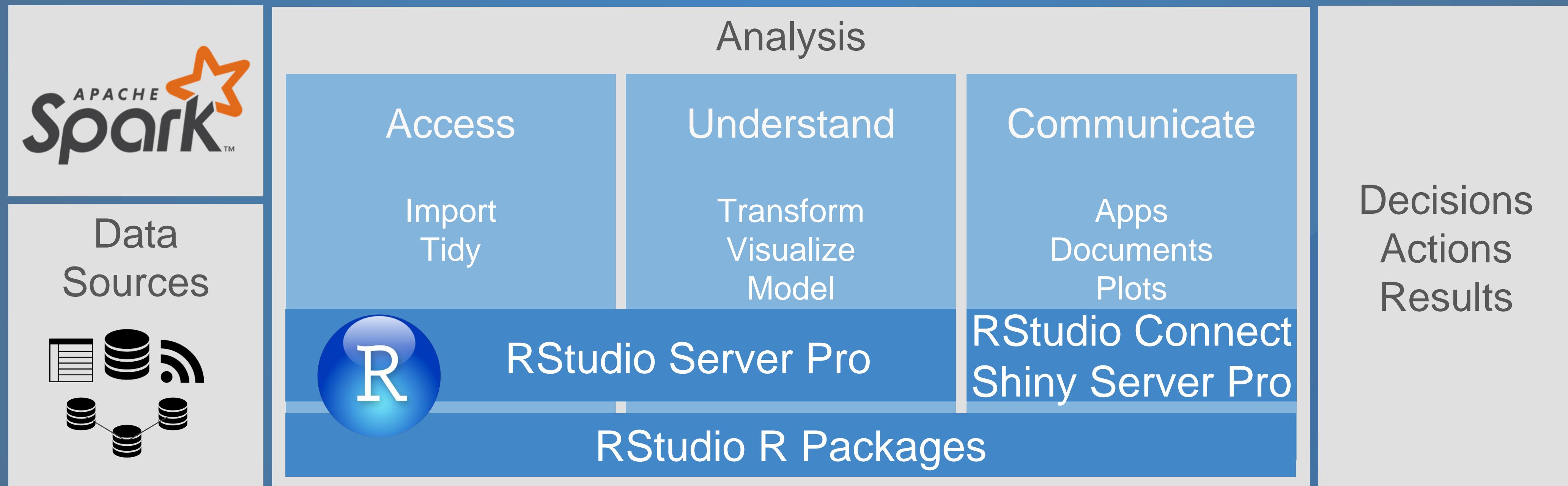


R



# Our Toolchain

FAST, EASY, REPRODUCIBLE...



# RSTUDIO PRODUCTS

## [RStudio and RStudio Server](#)

- Open source IDE to improve the usability of R and the productivity of R users (like Eclipse or Visual Studio but for R). Runs on Windows, OSX, and Linux or over the Web as a server

## [RStudio Commercial Desktop and RStudio Server Pro](#)

- Commercial IDEs to enable wider adoption of R in the enterprise

## [Shiny Server](#)

- Open source web application server to share interactive data visualizations created with R

## [Shiny Server Pro](#)

- Commercial web application server to enable enterprise scale deployment of interactive data visualizations, web applications and reproducible reports created with R

## [shinyapps.io](#)

- Hosted service for deploying interactive reports and web applications created with R

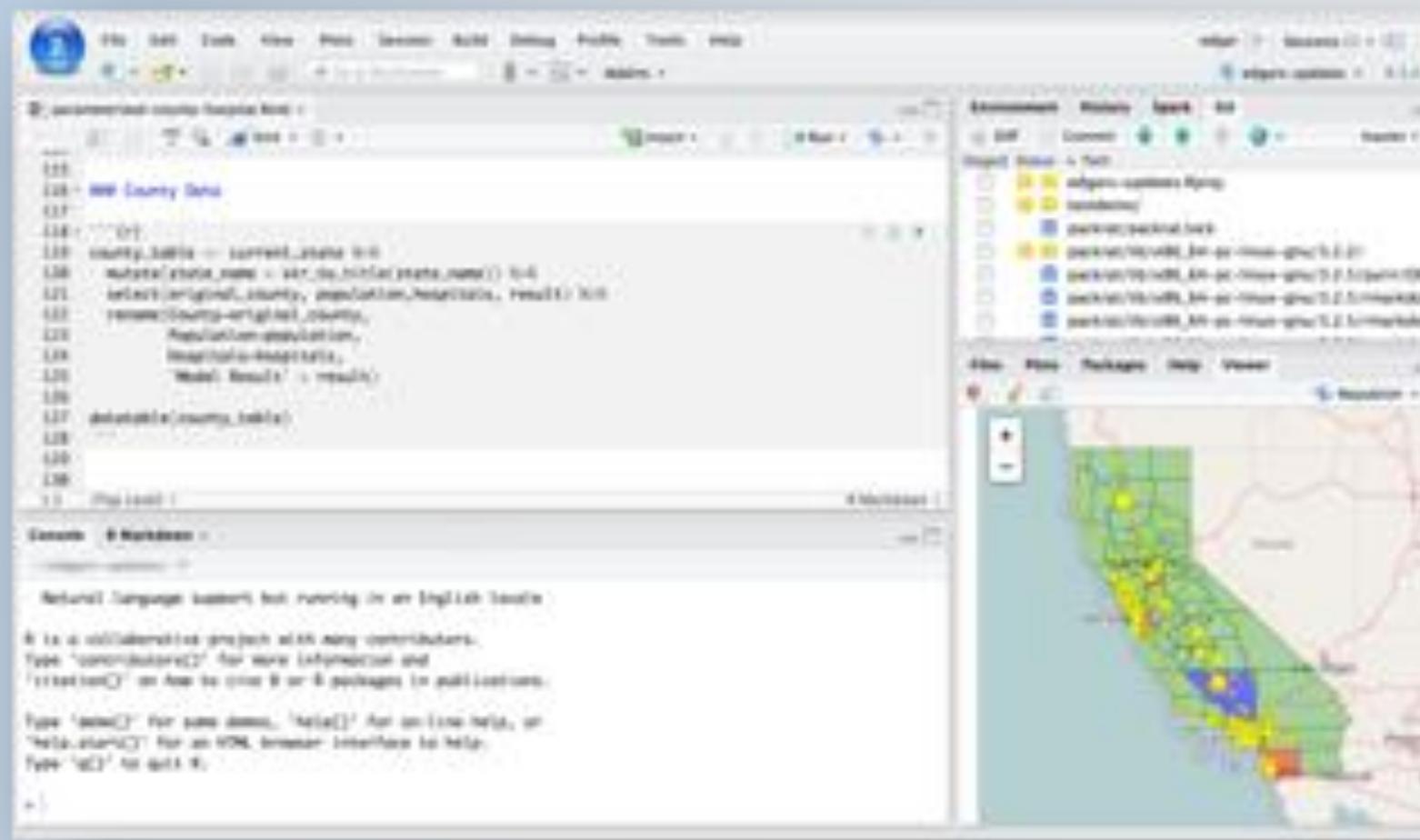
## [RStudio Connect](#)

- A new publishing platform for the work your teams create in R. Share Shiny applications, R Markdown reports, dashboards, plots, and more in one convenient place. Push-button publishing from the RStudio IDE, scheduled execution of reports, and flexible security policies to bring the power of data science to your entire enterprise.

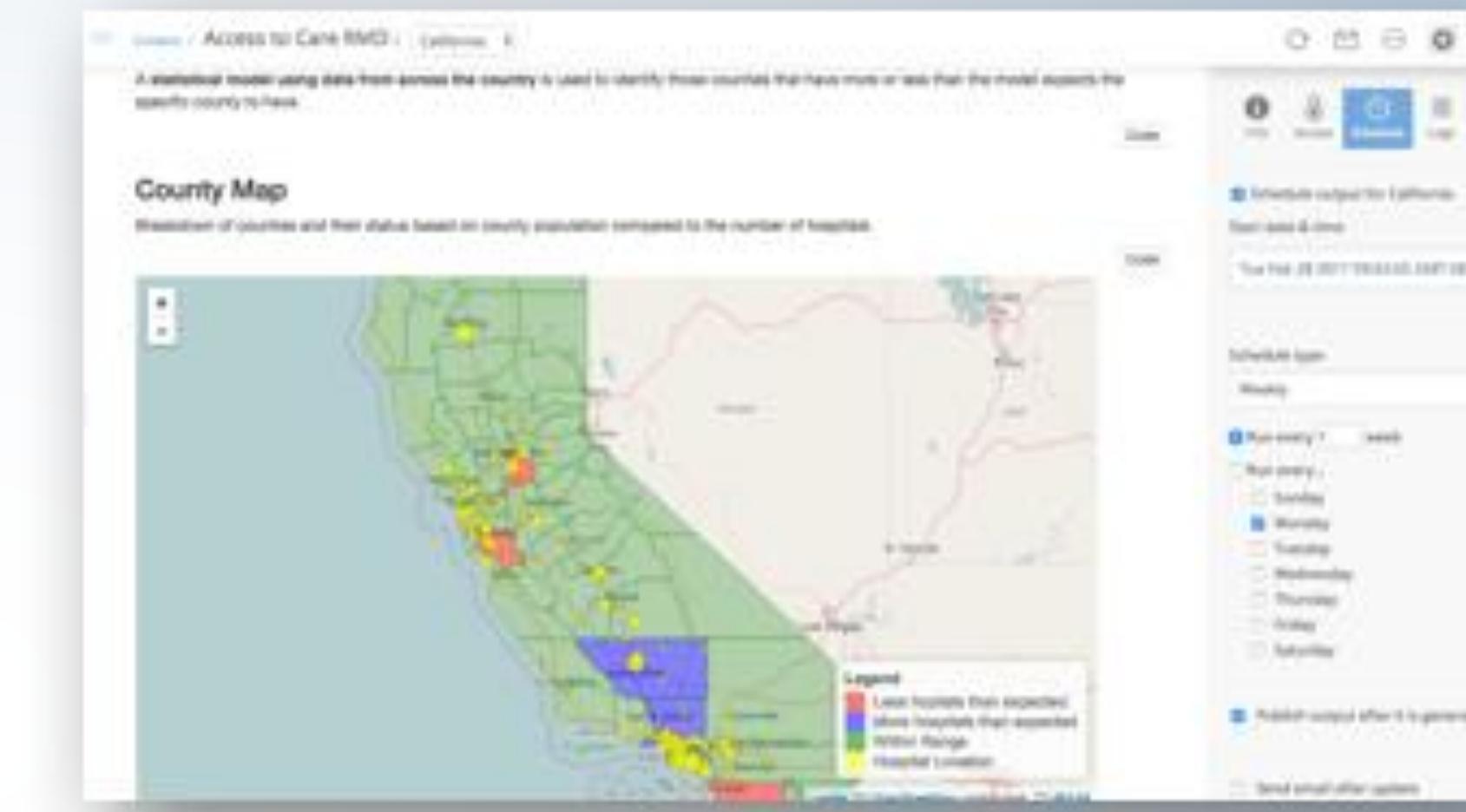
## [R Packages](#)

- Open source libraries for data manipulation (plyr and dplyr), data visualization (shiny, ggplot2, ggvis, htmlwidgets), and publishing (e.g., knitr, R Markdown...) and powerful productivity tools for R (packrat, devtools, roxygen2, testthat, tidyverse, fastread)

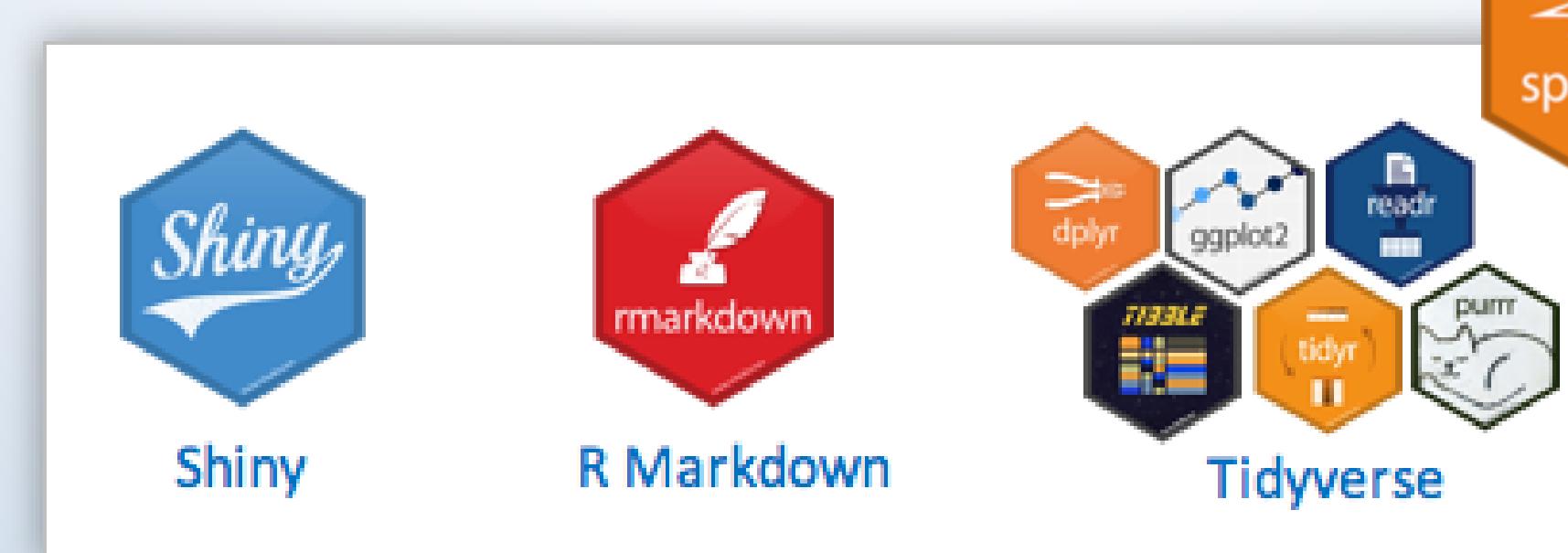
# RStudio Products and Packages



RStudio Server Pro



RStudio Connect  
Shiny Server Pro

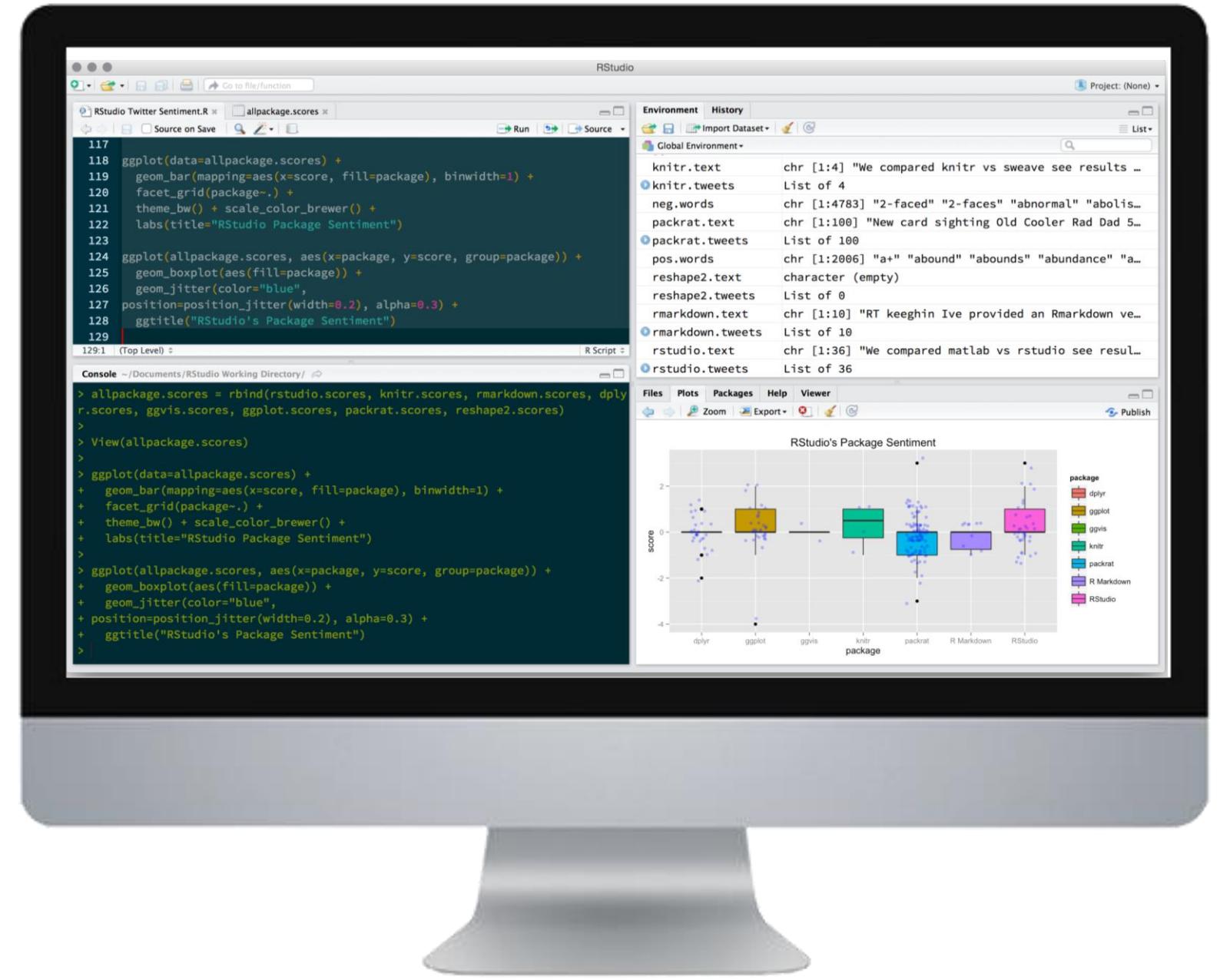


R Packages



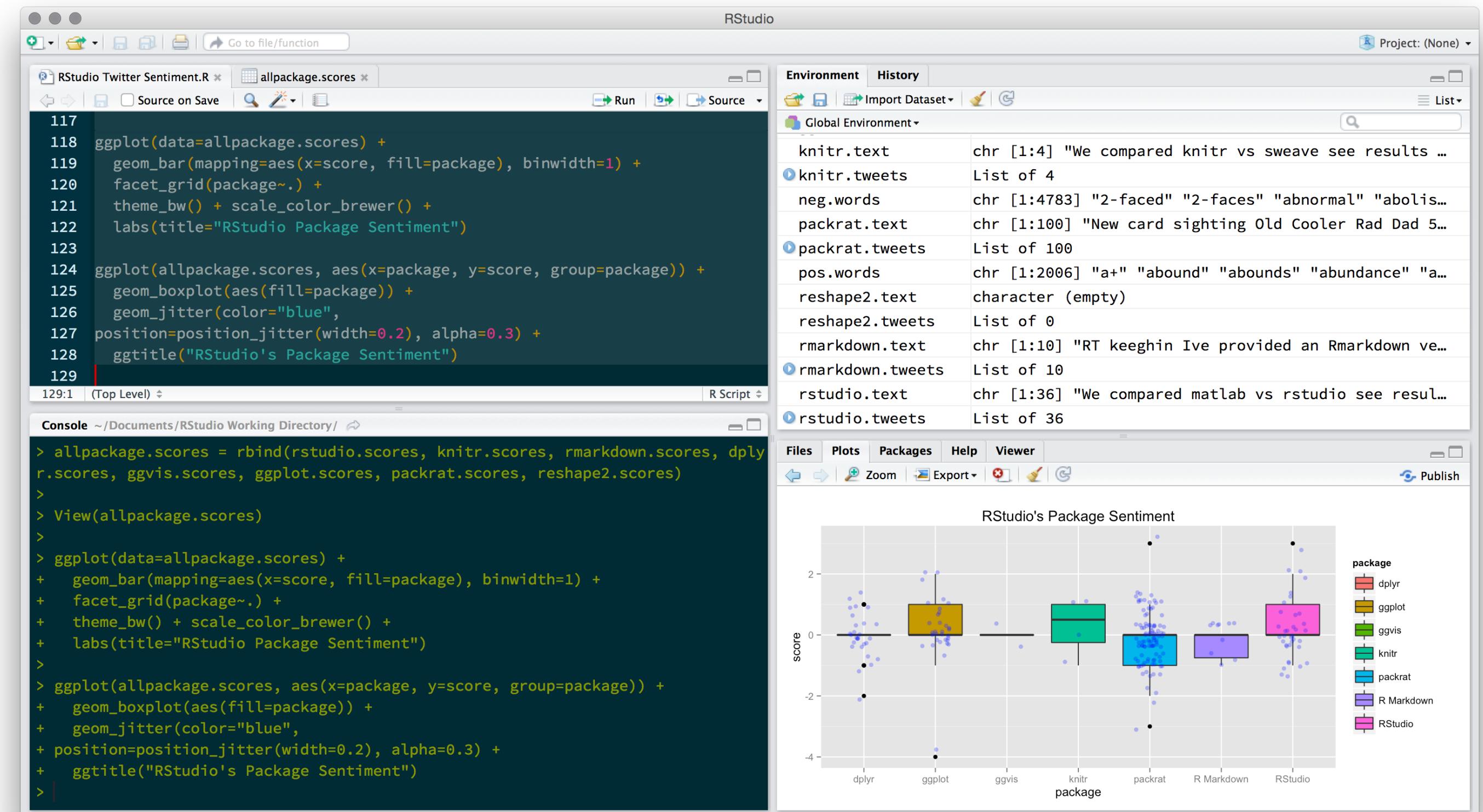
# RSTUDIO IDE

- Integrated Development Environment for R (i.e. like Eclipse or Visual Studio but for R)
- Runs on the Desktop (Windows, OSX, Linux) or over the Web as a server to enable shared resources and collaboration
- Released in 2012 and now the most popular front-end for R users with thousands of downloads per day
- Download the desktop IDE here:  
<http://www.rstudio.com/products/RStudio/#Desk>



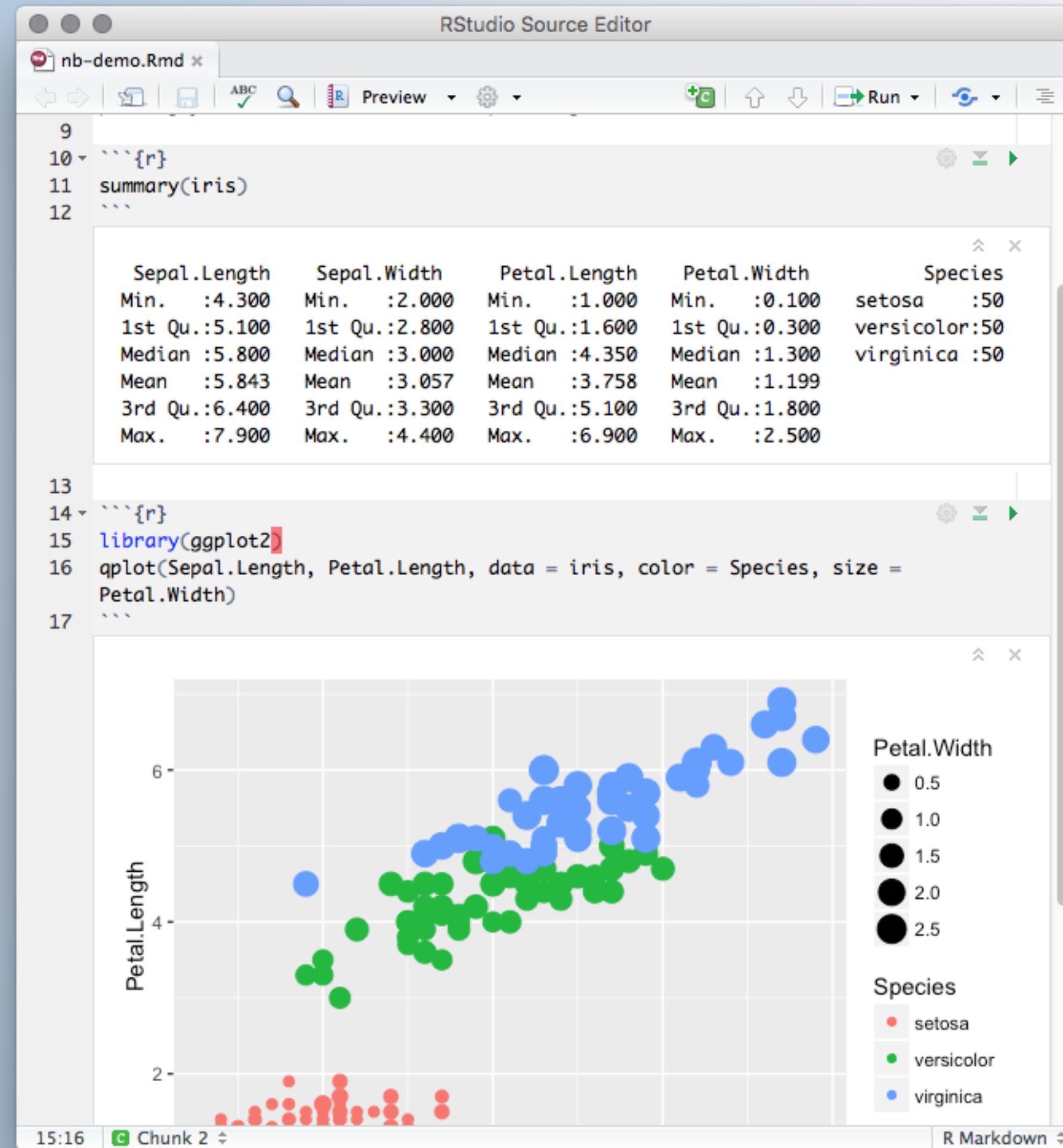
# RSTUDIO IDE

- Data viewer -- support large datasets, filtering, searching, sorting
- Code completion
- Code diagnostics
- Customizable code snippets
- Improved tools for Rcpp
- Multiple cursors
- Tab re-ordering
- New themes
- Enhanced Vim mode
- Notebooks
- Add-ins
- Session Management
- Project Sharing
- Collaborative Editing



And much more!

# RStudio Server Pro



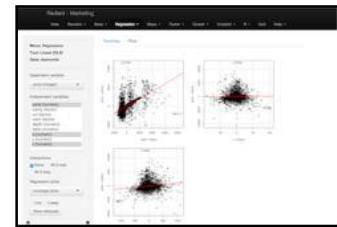
- Notebooks
- Bookdown
- R Markdown websites
- Data import
- Flex dashboards
- RStudio Add-ins
- Profvis
- Crosstalk

# SHINY

- Open source R package that facilitates the rapid creation and deployment of interactive web apps
- Targets data scientists/analysts with R expertise who want to share their analyses
- Uses spreadsheet-like programming semantics to make creating web applications with R very straightforward
- Allows analysts to put interactive analysis tools into the hands of decision makers immediately
- Building applications requires no HTML, CSS or JavaScript knowledge and eliminates the need for proprietary BI clients
- To learn more visit: <http://shiny.rstudio.com/>



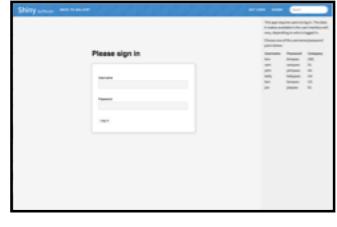
# WHAT CAN A SHINY APP DO?



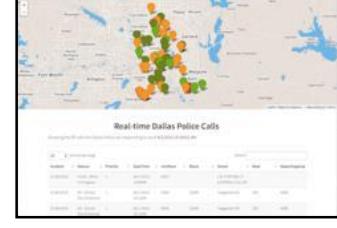
Make R analysis accessible to **non-programmers**



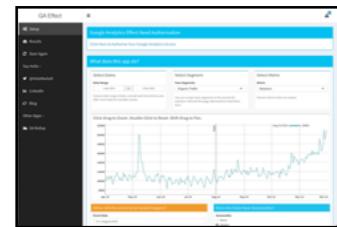
Highly **customizable**, highly **shareable** HTML front end



Read and write to **databases**



Monitor **streaming data**



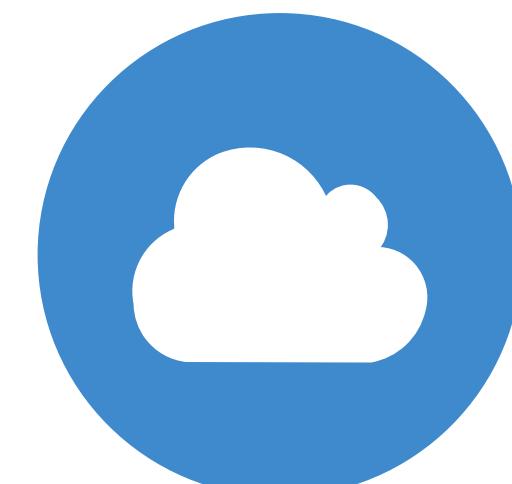
Require and use **authentication**



Ideal for Exploratory Data Analysis



Ideal Data Portal / Results Explorer / Simulation API / Dashboard



Share your app

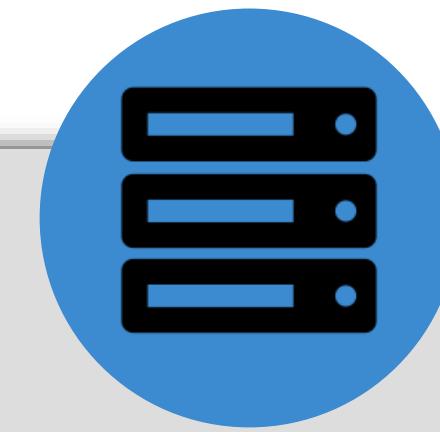


# SHINY SERVER OPEN SOURCE AND PRO



## Shiny Server

- A web application framework for R (i.e. the bridge enabling the power of R for the web)
- Reactive - Uses spreadsheet like programming semantics to make creating web applications with R
- Start and Stop a Shiny Process
- Translate non-Websocket traffic into Websockets
- Map URL's to particular applications



## Shiny Server Pro

Everything that's available in Shiny Server plus enterprise features:

- Administrative Tools - View and manage users, applications & resources
- Authentication - Secure access to applications
- Scalability - Enable multiple R instances per application
- No Centralized Storage - Only "Stateful" information for active sessions; all authentication information is stored in an encrypted cookie

# *What is the difference between Shiny and Shiny Server?*

## Shiny

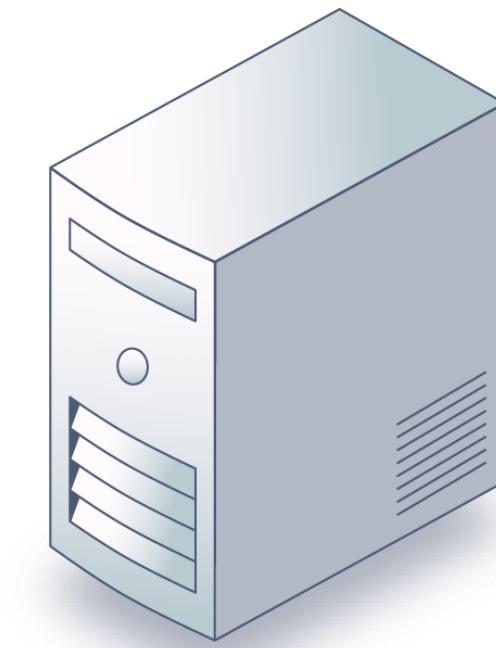


Free and open source R Package

Makes it incredibly easy to build interactive web applications with R

Automatic reactive binding between inputs and outputs and extensive pre-built widgets make it possible to build beautiful, responsive, and powerful applications.

## Shiny Server



Software you install on your server

Enable users to host and managing Shiny applications

Scale a Shiny application to support many users  
Protect and secure your applications  
Manage the user experience

# RSTUDIO CONNECT

A new publishing platform for  
the work your teams create in  
R.

Share Shiny applications, R  
Markdown reports,  
dashboards, plots, and more  
in one convenient place.



# RStudio Connect

*A publishing platform for all the work your team creates in R*

Content  
Creators



**Publish**  
  
**Push button**

## RStudio Connect



**Create variants**  
**Schedule jobs**  
**Distribute reports**

**Self-service**



Content  
Consumers



**Make decisions**  
**Take actions**  
**See results**

# Connect is Built for Data Scientists and IT

Analyst

IT

## Features

Push Button Deployment

Web UI for Managing Content

Email Integration

Job Scheduler

User Roles

Authentication: AD / PAM / LDAP Secure & Integrated

Metrics and Logging

## Solutions

Rapid Iteration

Self Service

Content Sharing

Automatic Updates

Access Control

Scalable & Reliable

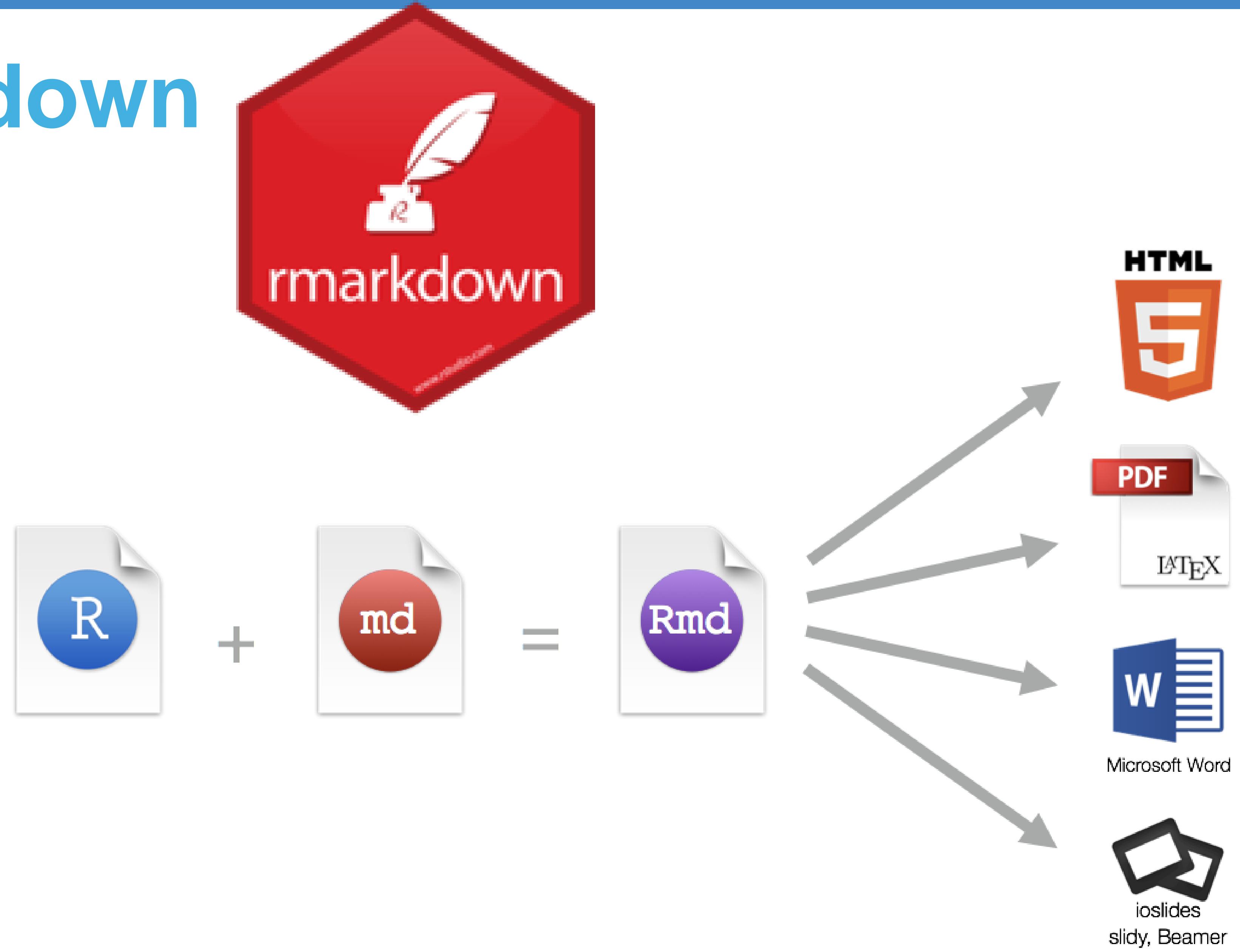
# R MARKDOWN

Can't we do  
better than?

Ctrl + C (Copy)  
Ctrl + V (Paste)



# R Markdown



## htmlwidgets for R:

- R bindings to JavaScript libraries
- Used to create interactive visualizations
- A line or two of R code is all it takes to produce an example

## Use htmlwidgets in:

- RStudio viewer pane
- R Markdown files
- Shiny Apps

[www.htmlwidgets.org](http://www.htmlwidgets.org)

# htmlwidgets

The screenshot shows the official website for htmlwidgets. At the top, there's a navigation bar with links for Home, Showcase, Develop, and GitHub. Below the navigation, a main heading reads "htmlwidgets for R". To the right, there's a screenshot of a web browser displaying a map of Oregon with various data points. On the left, there's explanatory text about what htmlwidgets are and how they can be used.

**htmlwidgets for R**

**Bring the best of JavaScript data visualization to R**

Use JavaScript visualization libraries at the R console, just like plots

Embed widgets in R Markdown documents and Shiny web applications

Develop new widgets using a framework that seamlessly bridges R and JavaScript

**At the R console   In R Markdown docs   In Shiny apps**

**Widgets in action**

See how just a line or two of R code can be used to create interactive visualizations with Leaflet (mapping), dygraphs (time-series), networkD3 (graph visualization), and more.

[See the showcase »](#)

# OTHER GOODIES

- Cheatsheets
- Webinars & Recordings

## Latest Webinars

### Getting your data into R

You can't use R for data analysis unless you can get your data into R. Getting your data into R can be a major hassle, so in the last few months Hadley Wickham has been working hard to make it easier.

In this webinar Hadley will discuss the places you most often find data (databases, excel, text files, other statistical packages, web apis, and web pages) and the packages (DBI, xml2, jsonlite, haven, readr, exel) that make it easy to get your data into R.

### GitHub Webinar Repository

Materials for this specific webinar

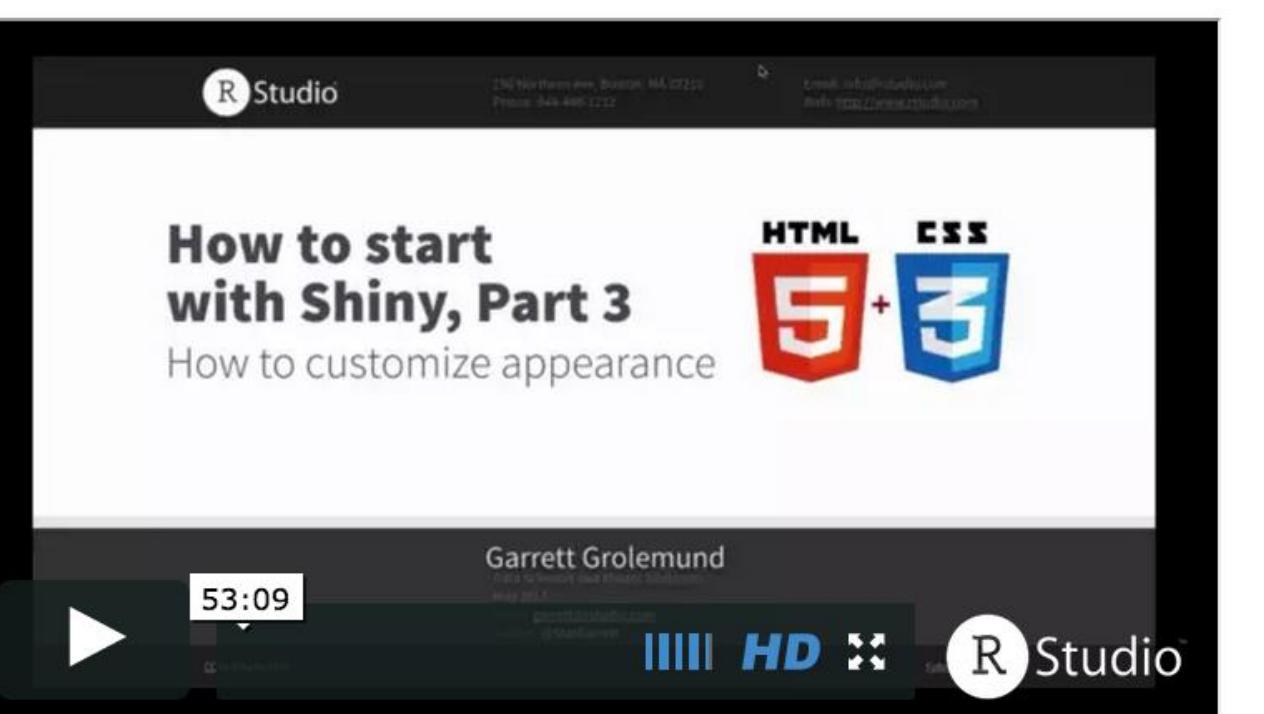
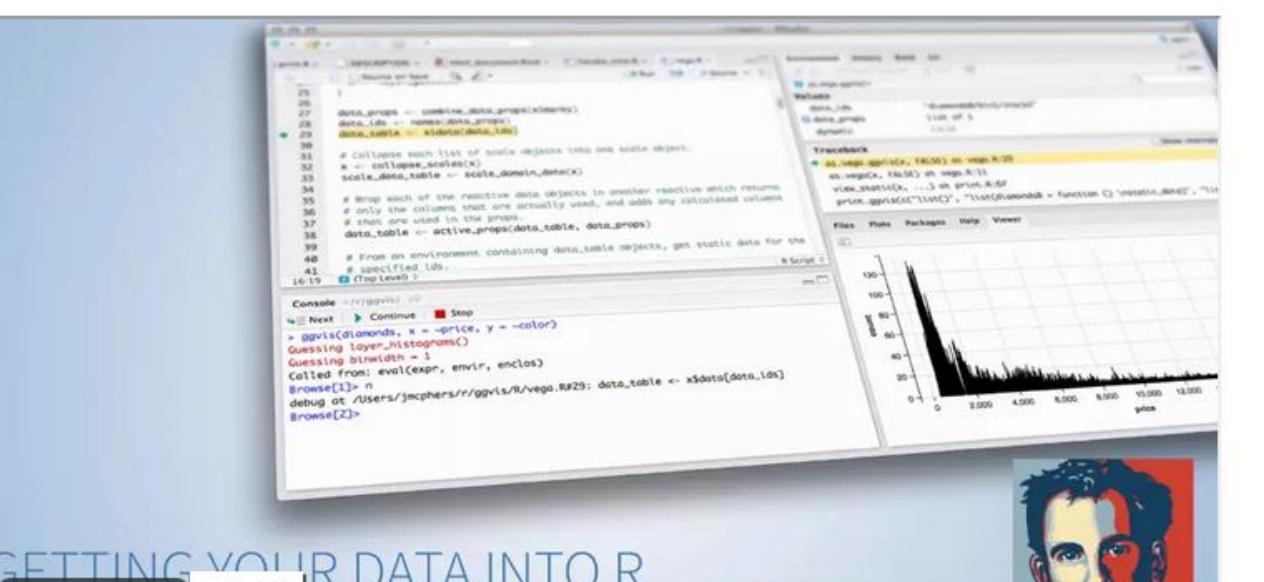
### How to start with Shiny – Part 3

In this talk (Part 3 of 3), Garrett Grolemund will show you how to customize the appearance of your app. You will learn how to arrange the components of your app into an attractive layout, as well as how to change the appearance of text, images, and other HTML elements in your app.

### GitHub Webinar Repository

Materials for this specific webinar

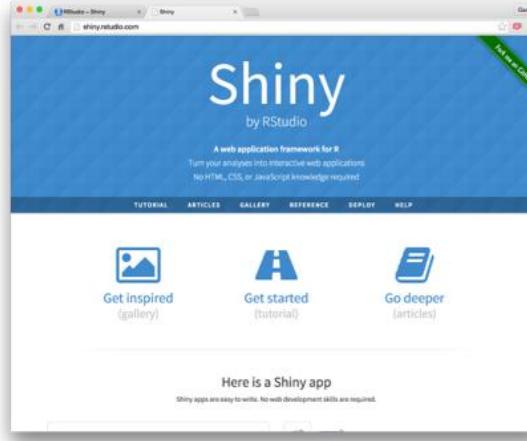
Alternate Link: [bit.ly/shiny-quickstart-3](http://bit.ly/shiny-quickstart-3)



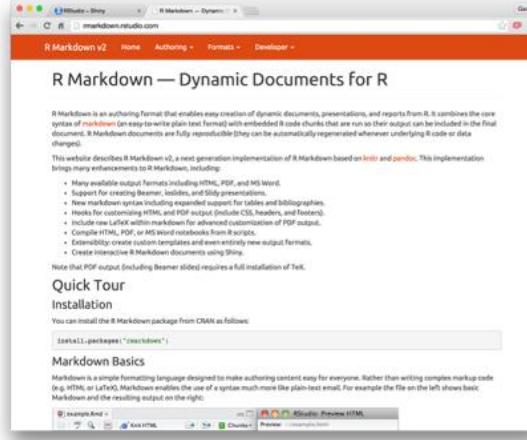
The collage includes the following sections:

- Data Visualization with ggplot2 Cheat Sheet**: A green-themed sheet covering Geoms (One Variable, Two Variables), Continuous X, Continuous Y, and Continuous Bivariate Distribution.
- Package Development with devtools Cheat Sheet**: A black-themed sheet covering Package Structure, Setup (DESCRIPTION), and devtools:use\_package().
- Data Wrangling with dplyr and tidyverse Cheat Sheet**: An orange-themed sheet explaining Tidy Data and operations like select(), filter(), and mutate().
- R Markdown Cheat Sheet**: A purple-themed sheet covering Workflow, Open, Write, Embed, Render, and various output formats.
- Shiny Cheat Sheet**: A blue-themed sheet covering Structure, server.R, Chunks, and Reactivity.
- render\* functions**: A light blue-themed sheet detailing functions like renderDataTable, renderImage, and renderPlot.

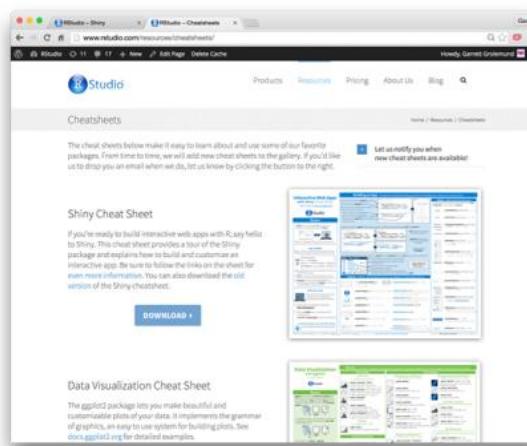
# USEFUL WEBSITES



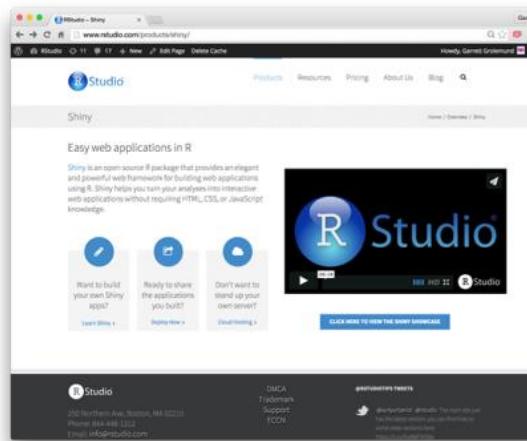
The Shiny development center:  
[shiny.rstudio.com](http://shiny.rstudio.com)



The R Markdown development center:  
[rmarkdown.rstudio.com](http://rmarkdown.rstudio.com)



Shiny and R Markdown cheat sheets:  
[www.rstudio.com/resources/cheatsheets](http://www.rstudio.com/resources/cheatsheets)



RStudio products:  
[www.rstudio.com/products/shiny](http://www.rstudio.com/products/shiny)



## Open Source & Free

Desktop: <http://www.rstudio.com/products/rstudio/download/>

RStudio Server: <http://www.rstudio.com/products/rstudio/download-server/>

Shiny Server: <http://www.rstudio.com/products/shiny/download-server/>

shinyapps.io beta: <https://www.shinyapps.io/admin/#/signup>

## 45 Day Evaluation of Pro Products

RStudio Server Pro: <http://www.rstudio.com/products/rstudio-server-pro/evaluation/>

Shiny Server Pro: <http://www.rstudio.com/products/shiny-server-pro/evaluation/>

# PLEASE STAY IN TOUCH



Blog - <http://blog.rstudio.org/>



Twitter - @rstudio #rstats <http://twitter.com/rstudio/>



GitHub - <https://github.com/rstudio/>



LinkedIn - <https://linkedin.com/company/rstudio-inc>



Facebook - <https://www.facebook.com/pages/RStudio-inc>



Google+ - <https://plus.google.com/110704473211154995841/posts>

# *Community Activities*

## R Consortium

Supports the R foundation

## RStudio Community

## rstudio::conf Annual conference

2016 - Palo Alto  
2017 - Orlando Florida  
2018 - San Diego

## R Views Community blog

