



中国矿业大学 (北京)

China University of Mining & Technology, Beijing

一份不太简短的 R 语言介绍

黄湘云

新浪 BIP

2017 年 10 月

1. 前世

2. 今生

3. 社区箴言

4. 社区领袖

5. 数据可视化

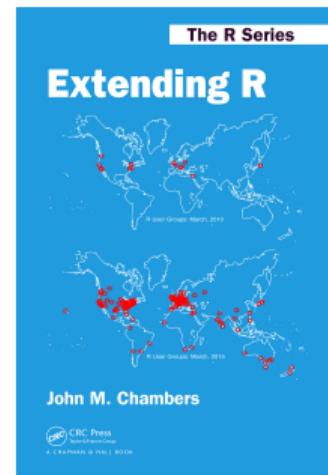
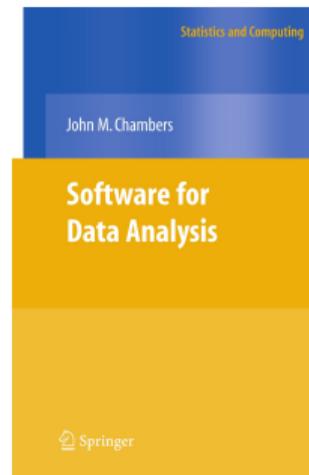
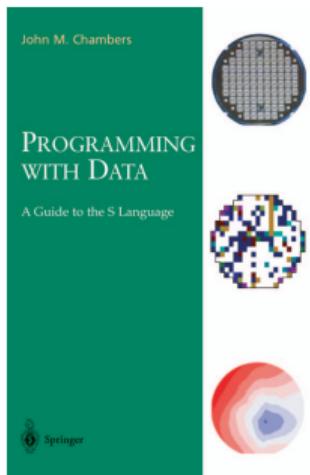
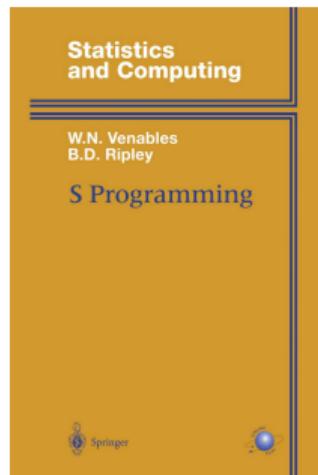
6. 数据报告

7. 学习 R

前世

来自何方

R was inspired by the S environment which has been principally developed by [John Chambers](#), with substantial input from Douglas Bates, [Rick Becker](#), Bill Cleveland, [Trevor Hastie](#)[[1](#), [2](#)], Daryl Pregibon and Allan Wilks.



今生

创世者

R was initially written by **Robert Gentleman** and **Ross Ihaka** also known as “**R & R**” of the Statistics Department of the University of Auckland.

- Robert Gentleman joined [23andMe](#) in 2015 as VP of computational biology

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- Ross Ihaka

维护者

- R Development Core Team (Since mid-1997):

```
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何去何从

1. 要到哪里去

R is **GNU S**, a freely available language and environment for statistical computing (统计计算) and graphics (统计图形)

R provides a wide variety of statistical and graphical techniques: linear and nonlinear modelling, statistical tests, time series analysis, classification, clustering, etc.

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- 可以看看 CRAN 的 [TaskViews](#) 栏

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- 还可以看看 [Bioconductor](#) 官网

社区箴言

Paul Murrell

If you imagine that this pen is Trellis, then Lattice is not this pen.

-- Paul Murrell (on the difference of Lattice (which eventually was called grid) and Trellis)

DSC 2001, Wien (March 2001)

Have you ever wanted to write a book, but not known where to start? Now is a very good time to jump in, because there is currently a very simple recipe for success: just put R in the title and you will have to beat the publishers off with a stick!

-- Paul Murrell

ASA Statistical Computing & Graphics Newsletter 17(2) (November 2006)

Barry Rowlingson

I'd like to prefix all these solutions with 'Here's how to do it, but don't actually do it you crazy fool'. It's on a par with redefining pi, or redefining '+'. And then redefining '<-'. These techniques have their proper place, and that would be in the currently non-existent obfuscated R contest.

No, the R-ish (iRish?) way is to index vectors from 1. That's what the R gods intended!

-- Barry Rowlingson (in a discussion how vectors in R could be indexed starting from 0)
R-help (March 2004)

Brian D. Ripley

To paraphrase provocatively, 'machine learning is statistics minus any checking of models and assumptions'.

-- Brian D. Ripley (about the difference between machine learning and statistics)
useR! 2004, Vienna (May 2004)

Let's not kid ourselves: the most widely used piece of software for statistics is Excel.

-- Brian D. Ripley ('Statistical Methods Need Software: A View of Statistical Computing')
Opening lecture RSS 2002, Plymouth (September 2002)

Peter Dalgaard

The documentation level of R is already much higher than average for open source software and even than some commercial packages (esp. SPSS is notorious for its attitude of "You want to do one of these things. If you don't understand what the output means, click help and we'll pop up five lines of mumbo-jumbo that you're not going to understand either.")

-- Peter Dalgaard
R-help (April 2002)

Douglas Bates

Zhu Wang: I am trying to create a library which uses some Fortran source files [...]

Douglas Bates: Someone named Martin Maechler will shortly be sending you email regarding the distinction between 'library' and 'package' :-)

-- Zhu Wang and Douglas Bates

R-help (May 2004)

最后的话

For the S system, which has forever altered the way people analyze, visualize, and manipulate data S is an elegant, widely accepted, and enduring software system, with conceptual integrity, thanks to the insight, taste, and effort of John Chambers.

-- Association for Computing Machinery
ACM/Software System Award citation (1998)

社区领袖

Roger Bivand

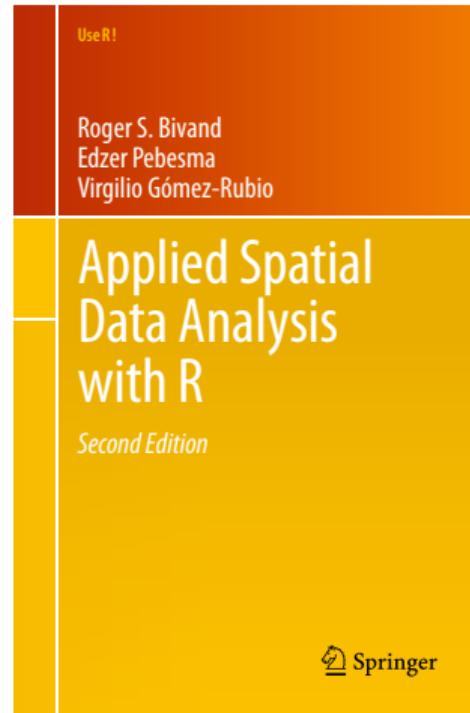
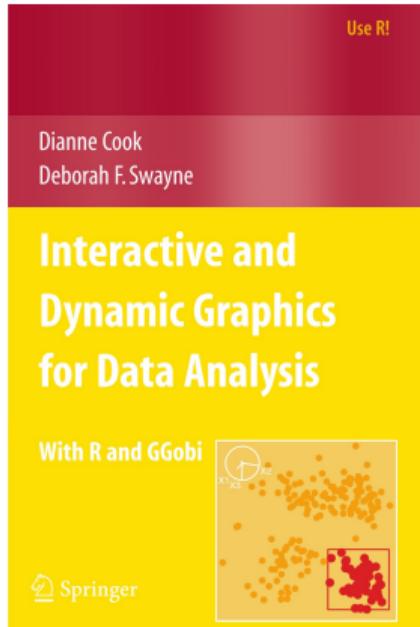


图 1: Applied spatial data analysis with R

Di Cook



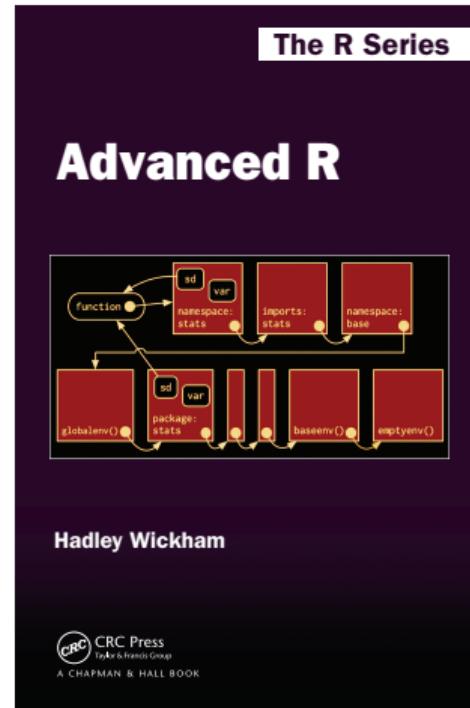
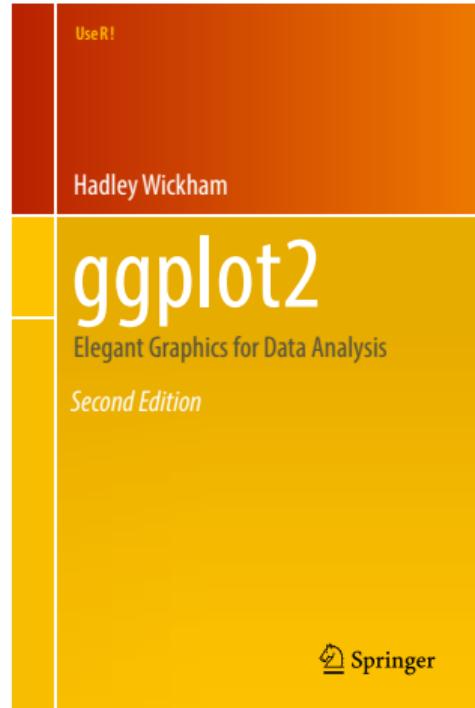
Hadley Wickham



图 2: Hadley Wickham

<http://hadley.nz/>

Hadley Wickham



John Chambers Award

- 2017, Carson Sievert [plotly](#)

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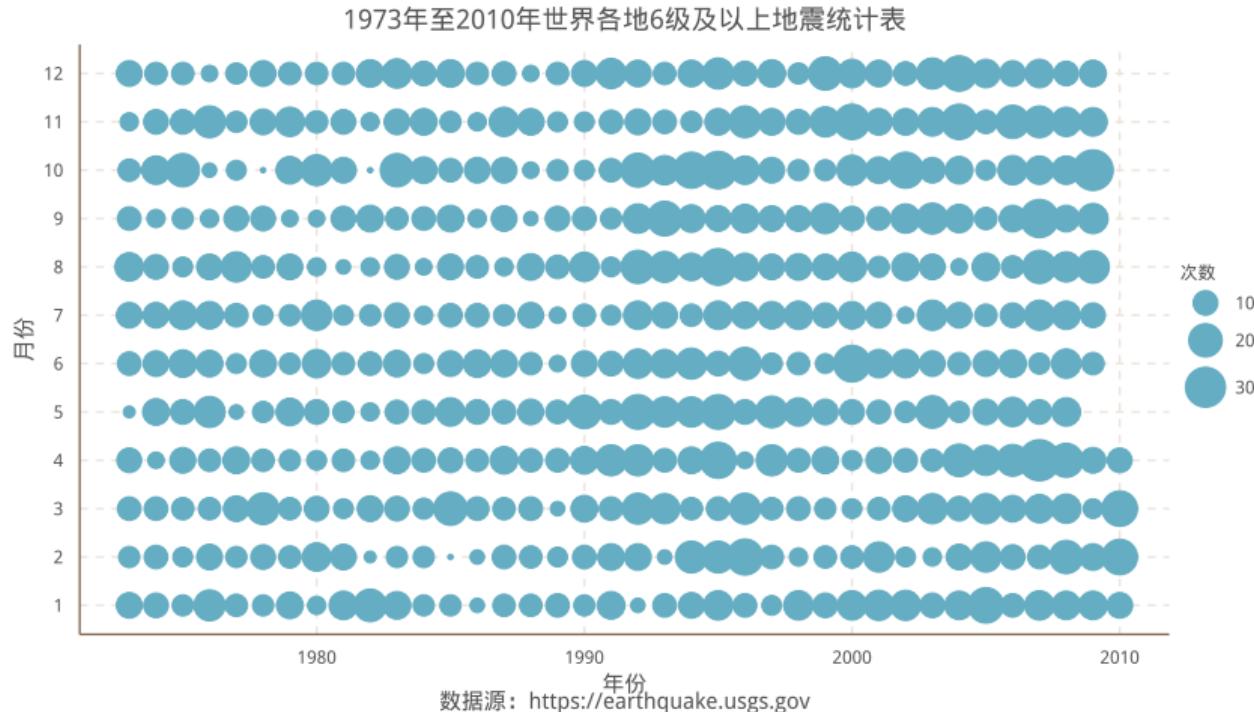
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- 2003, Daniel Adler [rgl](#)

数据可视化

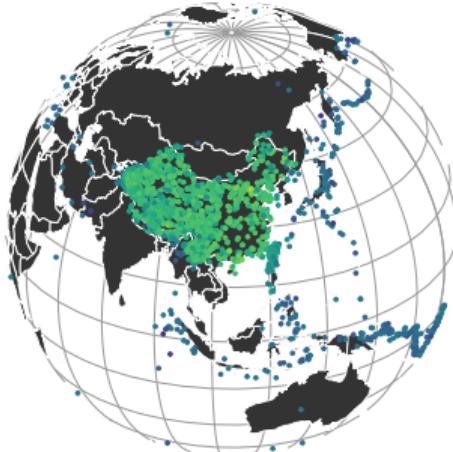
1973-2010 全球 6 级以上地震

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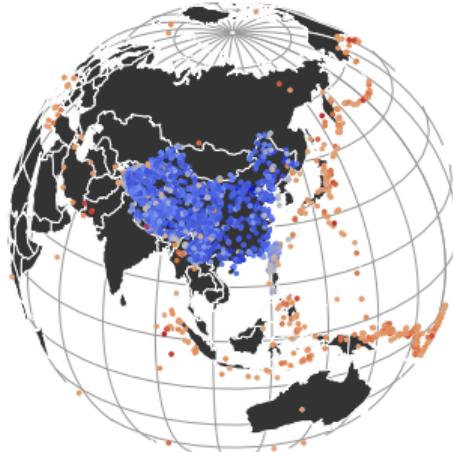
2012.4–2017.8 中国 5 级及以上地震

2012-04-26 01:10:55 至 2017-08-08 23:51:12



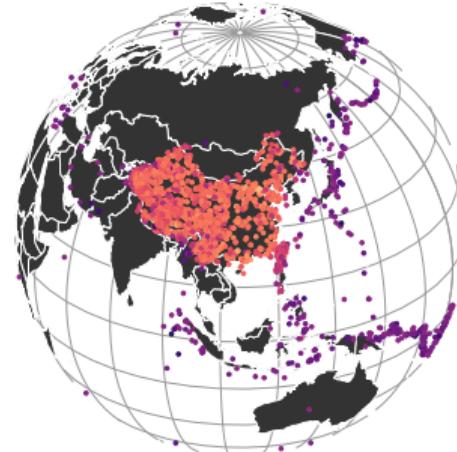
数据源: <http://news.ceic.ac.cn/>

2012-04-26 01:10:55 至 2017-08-08 23:51:12



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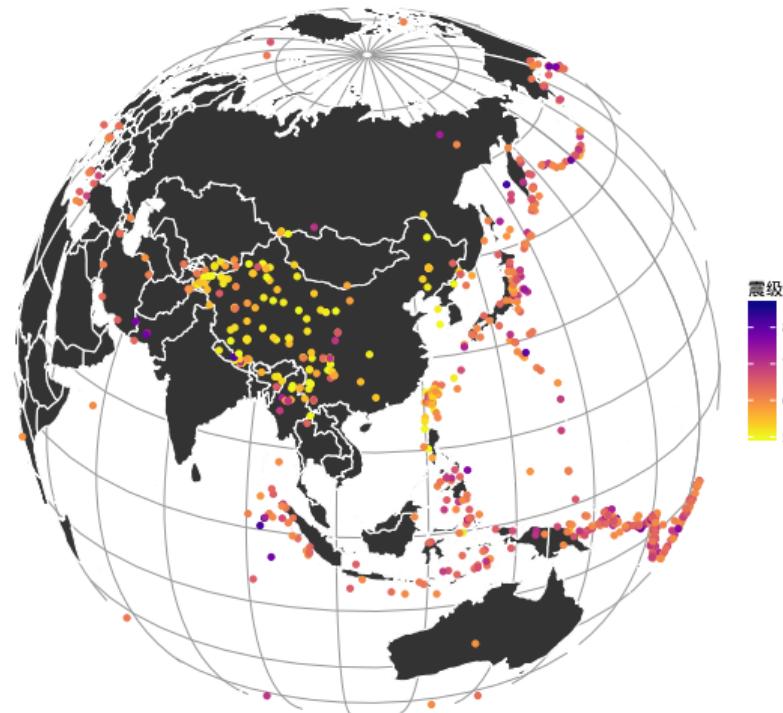
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2015 年 11 月 28-30 日雾霾时空过程 @ 王江浩

Using R packages and education to scale Data Science at Airbnb



图 4: Ricardo Bion https://github.com/ricardo-bion/medium_visualization

R 包依赖关系网络

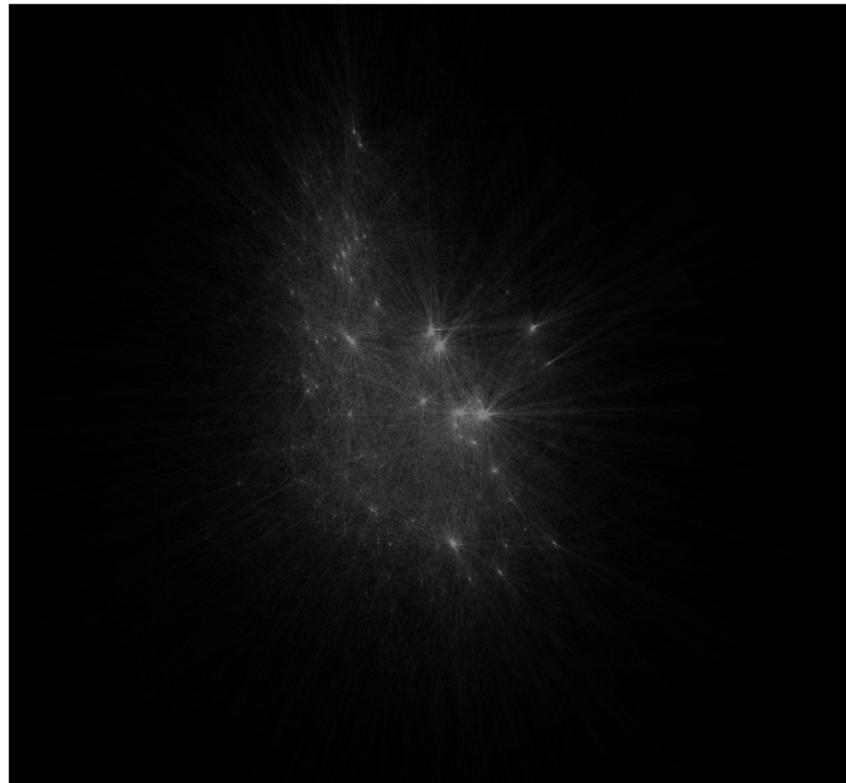
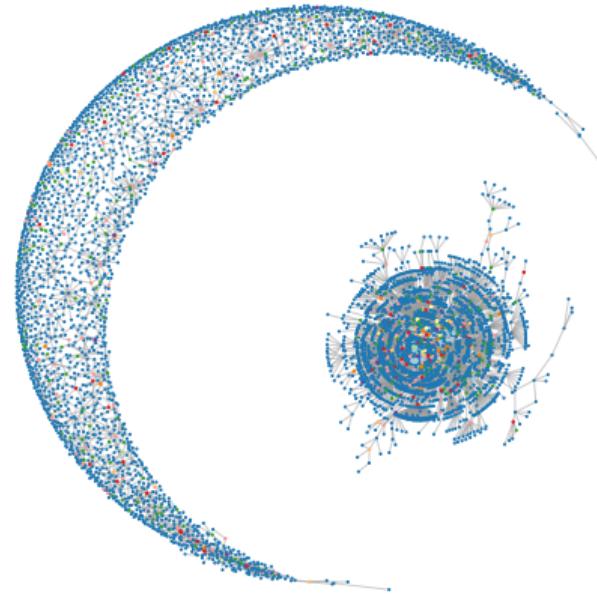
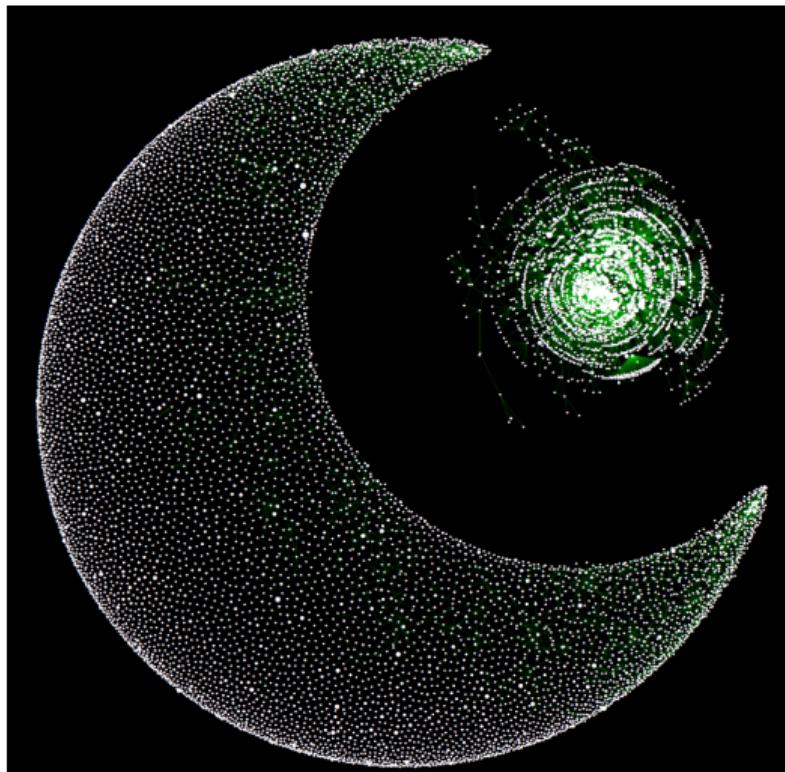


图 5 所有开发者

开发者协作关系网络



# of Packages	Color
>10	Light Blue
1	Dark Blue
2	Green
3	Red
4	Orange
5	Yellow
6	Purple
7	Magenta
8	Cyan
9	Light Green
10	Light Orange

Flat map great circle animation example

敬请欣赏

- Matthew Leonawicz

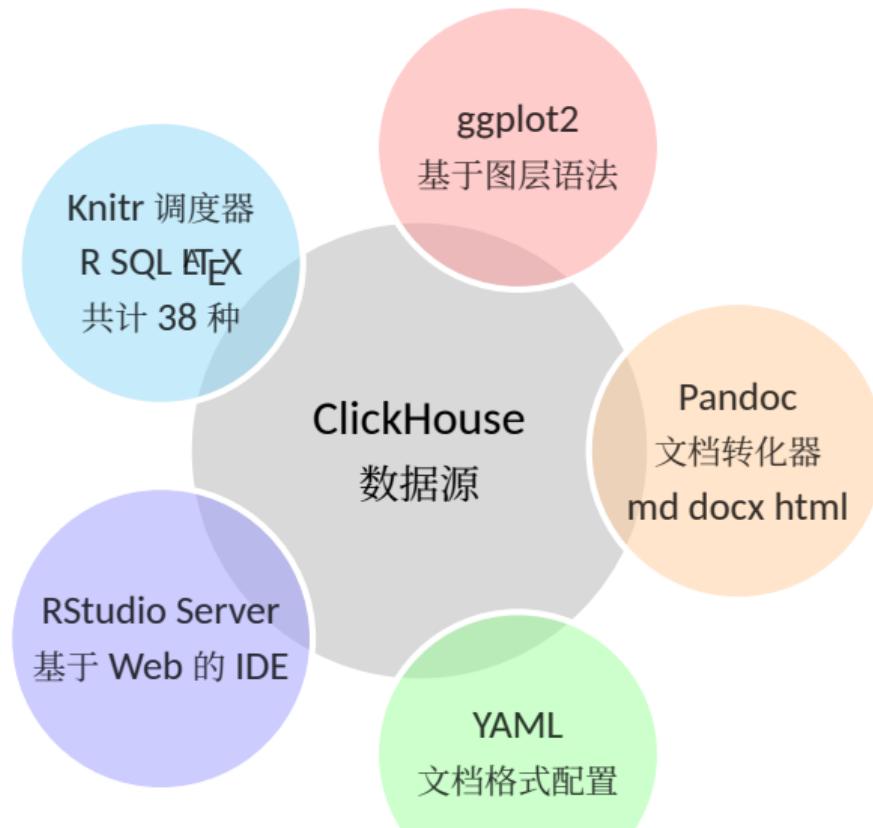
Flat map great circle animation example

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- <https://leonawicz.github.io/>

数据报告

基于 R Markdown 的分析报告



R Markdown 甩 Jupyter 几条街

- R + Markdown + Knitr + RStudio(IDE)

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1. Jupyter 不支持缓存

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-
- 处处学朕 (RStudio)，处处学得不像，朕是以宽仁治国，他 (Rodeo) 是以宽仁收买人心

ggplot2 画廊 I

```
[1] "ggalt"          "gganimate"      "ggbeeswarm"
[4] "ggbio"          "ggBrackets"     "ggChernoff"
[7] "ggCompNet"      "ggcorrplot"    "ggcyto"
[10] "ggdendro"       "ggdmc"         "gge"
[13] "ggedit"         "ggeffects"     "ggene"
[16] "gggenealogy"   "ggExtra"        "ggforce"
[19] "ggformula"      "ggfortify"     "ggghost"
[22] "ggguitar"       "gghalfnorm"   "ggimage"
[25] "ggiraph"        "ggiraphExtra"  "ggjoy"
[28] "gglasso"        "gglogo"        "ggloop"
[31] "ggm"            "ggmap"         "ggmcmc"
[34] "ggmosaic"       "ggnetwork"     "ggparallel"
[37] "ggplot2"        "ggplot2.SparkR" "ggplot2movies"
```

ggplot2 画廊 II

```
[40] "ggplotFL"          "ggplotgui"        "ggpmisc"
[43] "ggpolypath"        "ggpubr"           "ggpval"
[46] "ggQC"               "ggradar"          "ggRandomForests"
[49] "ggraph"              "ggraptr"          "ggrepel"
[52] "ggridges"            "ggROC"             "ggsci"
[55] "ggseas"              "ggseqlogo"         "ggsignif"
[58] "ggsn"                "ggspatial"         "ggspectra"
[61] "ggstance"            "ggswissmaps"      "ggtech"
[64] "ggtern"               "ggThemeAssist"    "ggthemes"
[67] "ggthemr"              "ggtree"            "ggvis"
```

ggplot2

- 理论基础扎实 (ggvis) [6]

ggplot2

- 理论基础扎实 (ggvis) [6]
- 功能全面 (435 个函数)

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 -  <http://www.sthda.com/english/>

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- 爆栈网 18,000+ 问题

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 -  <https://stackoverflow.com/questions/tagged/ggplot2>

光说不练假把式

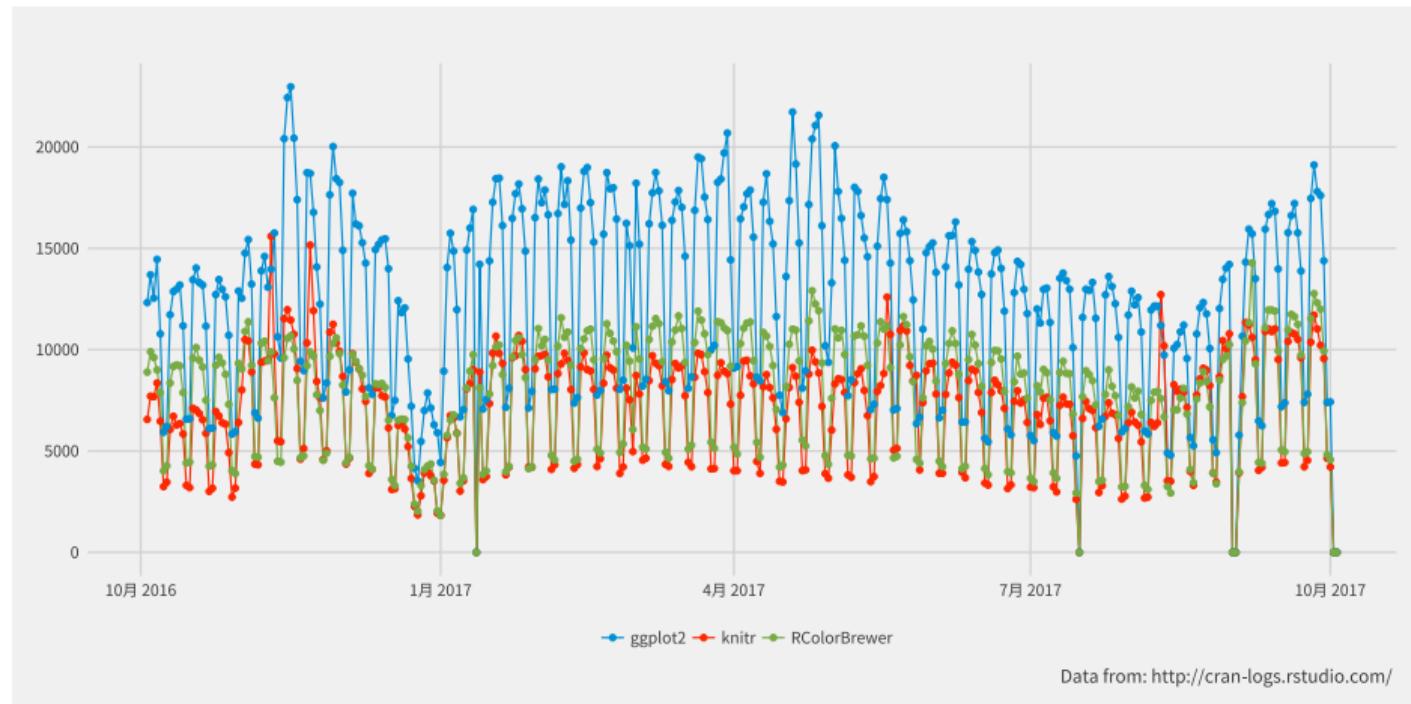


图 6: 每日下载量

饼图

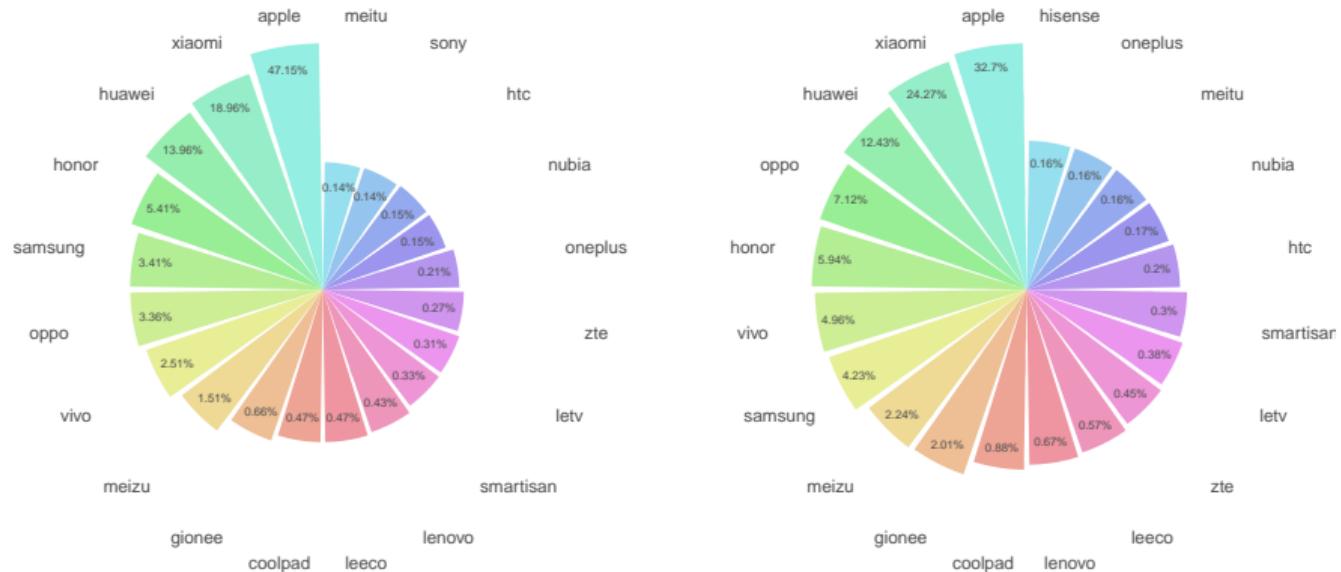
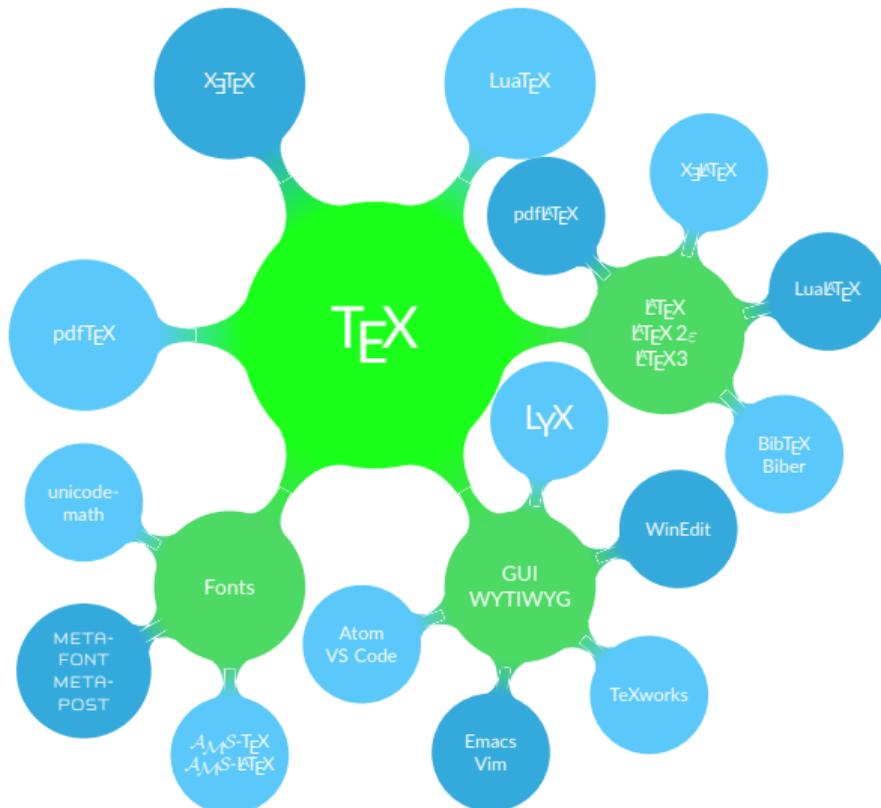


图 7: 一线和二三线各品牌手机份额对比

了解一点 \LaTeX



学习 R

自带 R 包共 29 个

```
Pkgs <- sapply(list.files(R.home('library')), function(x)
  packageDescription(pkg = x, fields = "Priority"))
names(Pkgs[Pkgs == 'base' & !is.na(Pkgs)])
```

```
[1] "base"      "compiler"   "datasets"   "graphics"   "grDevices"
[6] "grid"       "methods"    "parallel"   "splines"    "stats"
[11] "stats4"    "tcltk"     "tools"     "utils"
```

```
names(Pkgs[Pkgs == 'recommended' & !is.na(Pkgs)])
```

```
[1] "boot"       "class"      "cluster"    "codetools"   "foreign"
[6] "KernSmooth" "lattice"    "MASS"       "Matrix"     "mgcv"
[11] "nlme"       "nnet"       "rpart"     "spatial"    "survival"
```

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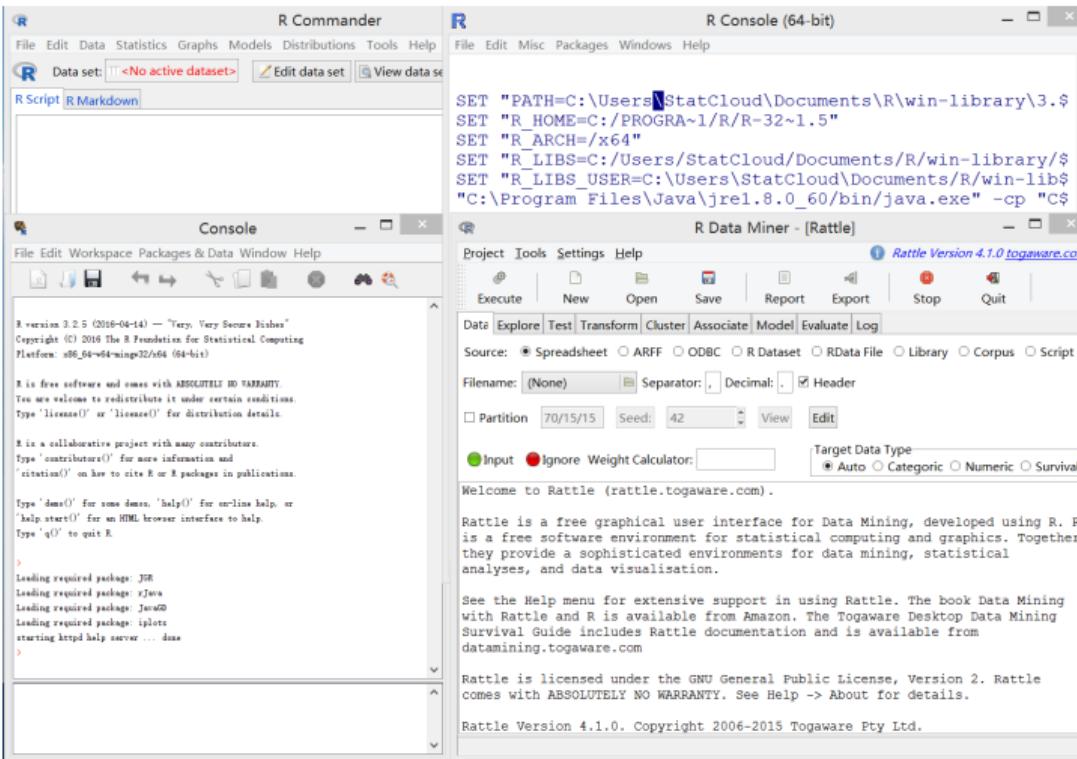
英文

- <https://cran.r-project.org/other-docs.html>

中文

- 常见问题解答（刘思喆等搜集于中文论坛）

称手的兵器



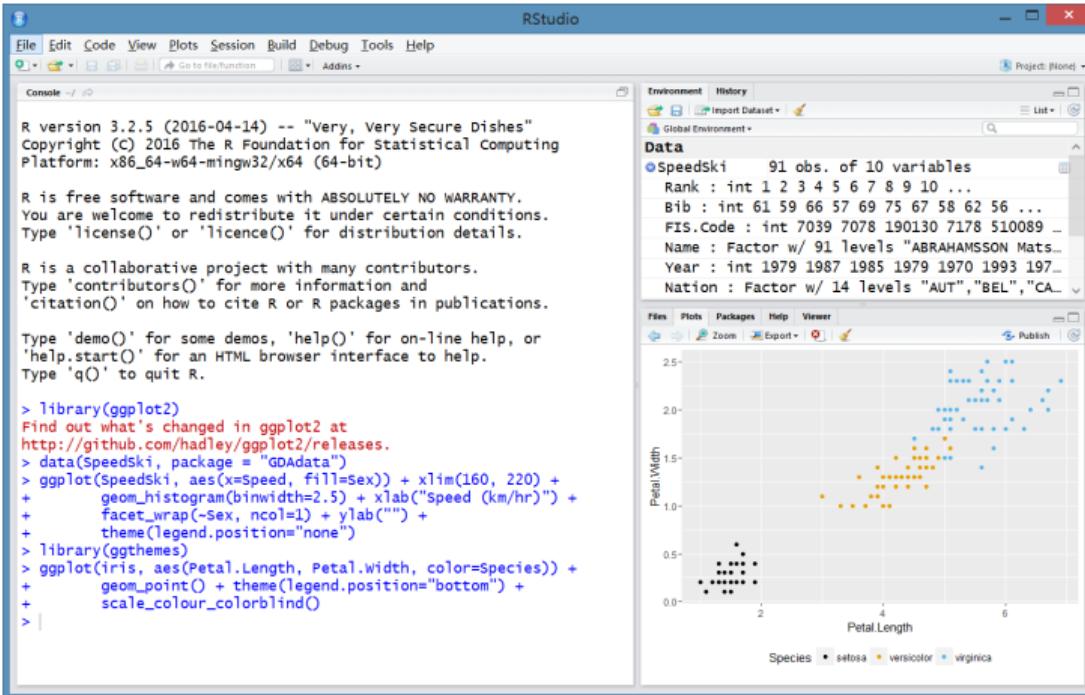
称手的兵器

The screenshot shows the Microsoft Visual Studio interface with several windows open:

- Server Explorer**: Shows a connection to "server R".
- R Script Editor**: Displays an R script named "maskdown.R". The script performs various data manipulations and merges, including:
 - Filtering routes by sourceAirportID.
 - Grouping by sourceAirportID.
 - Summarizing departures.
 - Merging the departures data set with the original data set containing latitude and longitude.
 - Creating a tooltip column for each airport name.
 - Calculating the square root of the number of departures as the radius.
- R Package Manager**: Shows the "base" package is installed and loaded, with version 3.2.4.
- R Interactive**: Shows the execution history of the R script.
- R Plot**: Displays a map of Australia and New Zealand with data points.
- Variable Explorer**: Shows the global environment variables, including:

Name	Value	Type
airports	8107 obs. of 12 variables	data.frame
airports_with_departure	3270 obs. of 14 variables	data.frame
country	List of 14	list
country[1:10]	int [1:3270] 1 2 3 4 5 6 7 8 9 10 ...	integer
country[[1]]	"Solomon Islands"	character
country[[2]]	"Vanuatu"	character
country[[3]]	"Fiji"	character
country[[4]]	"Samoa"	character
country[[5]]	"Tonga"	character
country[[6]]	"Niue"	character
country[[7]]	"Palau"	character
country[[8]]	"Marshall Islands"	character
country[[9]]	"Kiribati"	character
country[[10]]	"Nauru"	character

称手的兵器



称手的兵器

The screenshot shows the Tinn-R IDE interface. On the left, there's a sidebar titled 'Tools' with tabs for Misc, Markup, Results, Spell, and Database. Below it is an 'Explorers' section with a 'Mirrors' tab selected, showing a list of mirrors including Brazil, Canada, Chile, China, Colombia, Czech Republic, Denmark, Ecuador, El Salvador, Estonia, France, Germany, and others. A message at the bottom of this sidebar says: 'Center for Comp. Biol. at Universidade Estadual de Santa Cruz' and 'http://nbcgib.uesc.br/mirrors/cran/'. At the bottom of the sidebar, it says 'Default: http://nbcgib.uesc.br/mirrors/cran/'.

The main area contains R code:

```
<<setup, include=FALSE, cache=TRUE>>
library(knitr)
# set global chunk options
opts_chunk$set(fig.path='figs',
               fig.align='center',
               fig.show='html')
options(replace.assign=TRUE,
        width=90)
@

\title{A Minimal Demo of knitr}
\author{Tinn-R Team (based on RStudio)}
\maketitle

To generate the HTML output
The associated shortcut is:

You can test if \textbf{knit}() works
get started with some boring R code.

<<boring-random>>=
set.seed(1121)
(x=rnorm(18))
mean(x)
var(x)
sd=
```

A tooltip is visible over the 'mean' function call, showing its definition:

```
mean
function (x, na.rm = FALSE)
sqrt(var(if (is.vector(x)) x else as.double(x)))
attr(x, "mean")
```

To the right of the code editor is the 'Rterm' window, which displays the R console output:

```
> (x=rnorm(18))
[1] 0.1449583 0.4383221 0.1531912
[4] 1.0849426 1.9995449 -0.8118832
[7] 0.1602680 0.5858923 0.3600980
[10] -0.0253084 0.1508809 0.1100824
[13] 1.3596812 -0.3269946 -0.7163819
[16] 1.8097690 0.5084011 -0.5274603

> mean(x)
[1] 0.3587774

> var(x)
[1] 0.6217067

> sd
function (x, na.rm = FALSE)
sqrt(var(if (is.vector(x)) x else as.double(x)))
attr(x, "mean")
```

At the bottom of the Rterm window, there's a status bar with the text 'R hotkeys active' and 'R -> TCP/IP [stats]'.

尽情探索吧

`help.start()`



Manuals

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- 覃文峰 <https://github.com/qinwf/awesome-R>

Bio

-  xiangyunfaith @ outlook.com

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-  xiangyunfaith @ outlook.com
-  Cloud2016

Bio

-  xiangyunfaith @ outlook.com
-  Cloud2016
-  Capital of Statistics  <https://cosx.org/members/>

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-  Capital of Statistics  <https://cosx.org/members/>
-  Sophorae

致谢

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- [1] Material from the book's webpage, R port, and packaging by Kjetil B Halvorsen.
ElemStatLearn: Data Sets, Functions and Examples from the Book: "The Elements of Statistical Learning, Data Mining, Inference, and Prediction" by Trevor Hastie, Robert Tibshirani and Jerome Friedman, 2015. R package version 2015.6.26.
- [2] Gareth James, Daniela Witten, Trevor Hastie, and Rob Tibshirani. *ISLR: Data for an Introduction to Statistical Learning with Applications in R*, 2017. R package version 1.1.
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- [6] Leland Wilkinson. *The Grammar of Graphics*. Springer-Verlag New York, 2005.
- [7] Donald Knuth. Literate programming. *The Computer Journal*, 27(2):97–111, 1984.