

# Mastering RStudio – Develop, Communicate, and Collaborate with R

RStudio helps you to manage small to large projects by giving you a multi-functional integrated development environment combined with the power and flexibility of the R programming language, which is becoming the lingua franca of data science for developers and analysts worldwide.

This book begins by guiding you through the installation of RStudio and explaining the user interface step by step. From there, the next logical step is to use this knowledge to improve your data analysis workflow. You will do this by building up your toolbox to create interactive markdown reports, pretty data visualizations, graphs, and even professional web applications and dashboards with the Shiny framework. Start to collaborate and share your R code with others, by exploring how to use Git and GitHub with RStudio, and how to build your own packages to ensure top-quality results. Finally, you put it all together in an interactive dashboard written with R.

## Who this book is written for

This book is aimed at all R developers and analysts who wish to take advantage of RStudio's extensive functionalities to make their R statistical development efforts easier. R programming experience is assumed, as well as knowledge of R's basic structures and a number of functions.

**[PACKT]** open source\*  
PUBLISHING community experience distilled



## What you will learn from this book

- Discover the RStudio IDE and details about the user interface
- Communicate your insights with R Markdown in static and interactive ways
- Learn how to use different graphic systems to visualize your data
- Build interactive web applications with the Shiny framework, in order to present and share your results
- Apply your knowledge about RStudio and R development to create a real-world dashboard solution
- Understand the process of package development and assemble your own R packages
- Easily collaborate with other people on your projects by using Git and GitHub
- Manage the R environment for your organization with RStudio and the Shiny server

\$ 49.99 US  
£ 31.99 UK

Prices do not include  
local sales tax or VAT  
where applicable



Visit [www.PacktPub.com](http://www.PacktPub.com) for books, eBooks,  
code, downloads, and PacktLib.



<b>Preface</b>	<b>xi</b>
<b>Chapter 1: The RStudio IDE – an Overview</b>	<b>1</b>
<b>Downloading and installing RStudio</b>	<b>1</b>
Installing R	2
For Ubuntu	2
Using RStudio with different versions of R	3
Windows	3
Ubuntu	3
Updating RStudio	3
Getting to know the RStudio interface	4
The four main panes	4
The Source editor pane	6
Syntax highlighting	8
Code completion	8
Executing R Code from the source pane	10
Code folding	11
Debugging code	13
The Environment and History panes	14
History pane	16
Console pane	16
The Files, Plots, Packages, Help, and Viewer panes	16
The Files pane	17
The Plot pane	17
The Packages pane	20
The Help pane	21
The Viewer pane	21
Customizing RStudio	22
Using keyboard shortcuts	24



<b>Working with RStudio and projects</b>	<b>25</b>
Creating a project with RStudio	26
Locating your project	27
Using RStudio with Dropbox	27
Preventing Dropbox synchronization conflicts	27
Creating your first project	28
Organizing your folders	29
Saving the data	30
Analyzing the data	30
Correcting the path for report exporting	30
Exporting your analysis as a report	36
<b>Summary</b>	<b>37</b>
<b>Chapter 2: Communicating Your Work with R Markdown</b>	<b>39</b>
<b>The concept of reproducible research</b>	<b>39</b>
<b>Doing reproducible research with R Markdown</b>	<b>40</b>
What is Markdown?	40
What is literate programming?	41
A brief side note on Sweave	41
Dynamic report generation with knitr	42
What is R Markdown?	42
A side note about LaTeX	42
Configuring R Markdown	43
<b>Getting started with R Markdown in RStudio</b>	<b>43</b>
Creating your first R Markdown document	43
<b>The R Markdown interface</b>	<b>47</b>
Inspecting the R Markdowns panes	47
Explaining the R Markdown File pane settings	48
File tab arrows	48
Saving current document	48
Spell check	48
Find/replace	49
Question mark	49
Knit HTML	50
Gear icon	50
Run and re-run icons	52
Chunks	52
Jump to menu	52
Viewer pane options	53
<b>Advanced R Markdown documents</b>	<b>53</b>
Getting to know R code chunks	53
Customizing R code chunks	54
Chunk options	55
Embedding R code inline	57
Labeling code chunks	58



Pandoc and knitr options	59
Output formats	59
Changing the look of the output	60
Using a custom CSS style sheet	63
Using R Markdown templates	63
Package vignette	64
The Tufte handout	65
Compiling R Notebooks	67
Generating R Markdown presentations	67
ioslides	68
Slidy	69
Beamer	71
<b>Summary</b>	<b>72</b>
<b>Chapter 3: R Lesson I – Graphics System</b>	<b>73</b>
<b>The graphic system in R</b>	<b>73</b>
An introduction to the graphic devices	74
<b>The R graphics package—base</b>	<b>74</b>
Creating base plots	75
Using the base graphics	76
Base graphics parameters	77
Annotating with base plotting functions	79
<b>Introducing the lattice package</b>	<b>81</b>
Creating lattice plots	81
Getting to know the lattice plot types	82
The lattice panel functions	85
Lattice key points summary	87
<b>Introducing ggplot2</b>	<b>87</b>
Looking at the history of ggplot2	88
The Grammar of Graphics	88
<b>Applying The Grammar of Graphics with ggplot2</b>	<b>88</b>
<b>Using ggplot2</b>	<b>88</b>
Installing the ggplot2 package	89
Qplot() and ggplot()	89
Creating your first graph with ggplot2	89
Modifying ggplot objects with the plus operator	91
Setting the aesthetics parameter	91
Adding layers using geoms	92
Choosing the right geom	94
Modifying parameters	96
Changing the color of your plot	96
Changing the shape	98
Changing the size	98
Saving ggplot objects in variables	99



Using stats layers	100
Saving ggplot graphs	101
<b>Customizing your charts</b>	<b>102</b>
Subsetting your data	102
Setting titles	104
Changing the axis labels	104
Swapping the X and Y axes	105
Improving the look of ggplot2 charts	105
Creating graphs with the economist theme	106
Creating graphs with the wall street journal theme	107
<b>Interactive plotting systems</b>	<b>107</b>
Introducing ggvis	108
Our first ggvis graphic	108
Interactive ggvis graphs	110
A look at the rCharts package	111
Using googleVis	113
HTML widgets	114
dygraphs	114
Leaflet	115
rbokeh	117
<b>Summary</b>	<b>118</b>
<b>Chapter 4: Shiny – a Web-app Framework for R</b>	<b>119</b>
<b>Introducing Shiny – the app framework</b>	<b>119</b>
Creating a new Shiny web app with RStudio	122
Creating your first Shiny application	124
Sketching the final app	124
Constructing the user interface for your app	124
Creating the server file	125
The final application	126
Deconstructing the final app into its components	126
The components of the user interface	127
The server file in detail	129
The connection between the server and the ui file	130
<b>The concept of reactivity</b>	<b>131</b>
The source and endpoint structure	131
The purpose of the reactive conductor	133
<b>Discovering the scope of the Shiny user interface</b>	<b>134</b>
Exploring the Shiny interface layouts	134
The sidebar layout	134
The grid layout	136
The tabset panel layout	139
The navlist panel layout	141
The navbar page as the page layout	142



Adding widgets to your application	144
Shiny input elements	144
A brief overview of the output elements	145
Individualizing your app even further with Shiny tags	146
Creating dynamic user interface elements	148
Using conditionalPanel	148
Taking advantage of the renderUI function	150
<b>Sharing your Shiny application with others</b>	<b>151</b>
Offering a download of your Shiny app	151
Gist	152
GitHub	153
Zip file	154
Package	154
Deploying your app to the web	154
Shinyapps.io	154
Setting up a self-hosted Shiny server	157
<b>Diving into the Shiny ecosystem</b>	<b>157</b>
Creating apps with more files	157
Expanding the Shiny package	158
<b>Summary</b>	<b>159</b>
<b>Chapter 5: Interactive Documents with R Markdown</b>	<b>161</b>
<b>Creating interactive documents with R Markdown</b>	<b>161</b>
<b>Using R Markdown and Shiny</b>	<b>162</b>
Shiny Document	163
Shiny Presentation	164
Disassembling a Shiny R Markdown document	166
<b>Embedding interactive charts into R Markdown</b>	<b>166</b>
Using ggvis for interactive R Markdown documents	167
rCharts	169
googleVis	171
HTML widgets	172
dygraphs	172
Three.js and R	174
networkD3	175
metricsgraphics	177
<b>Publishing interactive R Markdown documents</b>	<b>178</b>
<b>Summary</b>	<b>179</b>
<b>Chapter 6: Creating Professional Dashboards with R and Shiny</b>	<b>181</b>
<b>Explaining the concept of dashboards</b>	<b>181</b>
<b>Introducing the shinydashboard package</b>	<b>182</b>
Installing shinydashboard	182
Explaining the structure of shinydashboard	182



<b>Showing the elements of shinydashboard</b>	<b>183</b>
Header elements	184
Sidebar elements	184
Body elements	186
Boxes	186
FluidRows	188
InfoBox and valueBox	189
<b>Building your own KPI dashboard</b>	<b>191</b>
Creating our data architecture	191
Sketching the look of our dashboard	192
Transferring our plan into R code	193
Considering a file and folder structure	193
Accessing our data sources	195
Putting it all together	203
<b>Summary</b>	<b>206</b>
<b>Chapter 7: Package Development in RStudio</b>	<b>209</b>
<b>Understanding R packages</b>	<b>209</b>
Understanding the package structure	210
<b>Installing devtools</b>	<b>211</b>
<b>Building packages with RStudio</b>	<b>211</b>
Creating a new package project with RStudio	212
Looking at the created files	214
<b>Using Packrat with a project</b>	<b>215</b>
<b>Writing the documentation for a package</b>	<b>217</b>
Creating Rd documentation files	217
Looking at an example documentation file	218
Adding examples	221
dontrun	221
dontshow	221
Editing the DESCRIPTION file	222
<b>Understanding the namespaces of a package</b>	<b>224</b>
<b>Building and checking a package</b>	<b>224</b>
Checking a package	226
<b>Customizing the package build options</b>	<b>226</b>
<b>Using roxygen2 for package documentation</b>	<b>227</b>
Installing the roxygen2 package	227
Generating Rd Files	228
<b>Testing a package</b>	<b>230</b>
Using testthat in a package	231
<b>Adding a dataset to a package</b>	<b>232</b>
Creating .rda files	233
Using LazyData with a package	234



<b>Writing a package vignette with R markdown</b>	<b>234</b>
Creating vignette files	237
<b>References for further information</b>	<b>238</b>
<b>Summary</b>	<b>239</b>
<b>Chapter 8: Collaborating with Git and GitHub</b>	<b>241</b>
<b>Introducing version control</b>	<b>241</b>
Installing Git	242
Installing Git on Windows	242
Installing Git on Linux	242
Configuring Git	242
Explaining the basic terminology	242
Repository	243
Commit	243
Diff	243
Branch	243
Merge	243
Fetch	243
Pull	243
Push	243
Using Git via shell	244
Using the shell from Rstudio	244
<b>Using Git with RStudio</b>	<b>245</b>
Using RStudio and GitHub via SSH	246
Creating a new project with Git	247
Explaining the gitignore file	248
Keeping track of changes	249
Recording changes	250
Introducing the Git drop-down menu	251
Undoing a mistake	251
Pushing to a remote repository on github.com	253
Using an existing GitHub project with RStudio	255
<b>Using branches</b>	<b>256</b>
Making a pull request	258
Reviewing and merging pull requests	259
<b>Further resources</b>	<b>260</b>
<b>Summary</b>	<b>260</b>
<b>Chapter 9: R for your Organization – Managing the RStudio Server</b>	<b>261</b>
<b>Managing the RStudio Server</b>	<b>261</b>
Using Amazon Web Services as the server platform	262
Creating an AWS account	262



Using S3 to store our data	264
Creating our bucket	264
Uploading a dataset to the bucket	265
Launching our EC2 instance	267
Choosing An amazon Machine Image	267
Choosing an instance type	267
Configuring instance details	269
Adding storage	271
Tagging an instance	272
Configuring a security group	272
Reviewing	273
Connecting with the new EC2 instance	275
What is SSH?	275
Bringing it all together	276
<b>Setting up R, RStudio, and the Shiny Server</b>	<b>278</b>
Choosing your RStudio version	278
Installing base R	279
Installing RStudio and the Shiny Server	282
RStudio and the Shiny Server in your browser	284
Administrating your RStudio server environment	285
Getting rid of the R memory problem	286
Connecting our S3 bucket with RStudio	287
Basic RStudio server management	287
Managing the Shiny Server	288
Basic commands for the Shiny Server	290
<b>Summary</b>	<b>290</b>
<b>Chapter 10: Extending RStudio and Your Knowledge of R</b>	<b>291</b>
<b>Extending RStudio, finding answers, and more</b>	<b>291</b>
<b>RStudio environment customizations</b>	<b>292</b>
Customizing the Rprofile	292
Where to find your Rprofile	292
Adding custom functions	292
<b>R help is on the way</b>	<b>295</b>
Getting questions and answers	295
Stack Overflow (Stack Exchange)	295
Data Science (Stack Exchange)	296
Cross Validated (Stack Exchange)	297
Open Data (Stack Exchange)	298
R mailing lists – R-help	299
Reddit	300
How to ask questions correctly	300



Learning more about packages, functions, and more	301
R FAQs	301
R and CRAN documentations	302
R search engines	303
RStudio cheat sheets	303
Sharing your R code	304
<b>Improving your R knowledge</b>	<b>305</b>
Learning R interactively	305
Try R	305
DataCamp	306
Leada	306
Swirl	307
Attending online courses	307
Coursera	307
Udacity	309
Other MOOC courses, related platforms, and programs	310
<b>Staying up to date in the R world</b>	<b>310</b>
R-Bloggers	310
The R Journal	311
<b>Summary</b>	<b>312</b>
<b>Index</b>	<b>313</b>

---