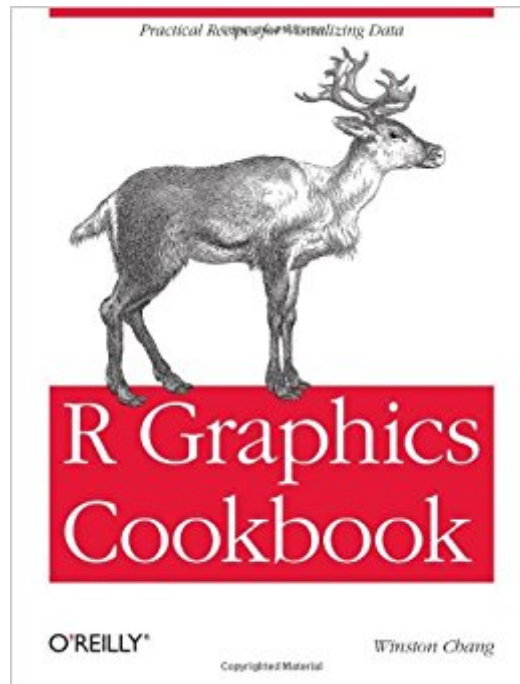




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R Graphics Cookbook: Practical Recipes For Visualizing Data



Synopsis

This practical guide provides more than 150 recipes to help you generate high-quality graphs quickly, without having to comb through all the details of R's graphing systems. Each recipe tackles a specific problem with a solution you can apply to your own project, and includes a discussion of how and why the recipe works. Most of the recipes use the ggplot2 package, a powerful and flexible way to make graphs in R. If you have a basic understanding of the R language, you're ready to get started. Use R's default graphics for quick exploration of data. Create a variety of bar graphs, line graphs, and scatter plots. Summarize data distributions with histograms, density curves, box plots, and other examples. Provide annotations to help viewers interpret data. Control the overall appearance of graphics. Render data groups alongside each other for easy comparison. Use colors in plots. Create network graphs, heat maps, and 3D scatter plots. Structure data for graphing.

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Q&A with Winston Chang, author of "R Graphics Cookbook: Practical Recipes for Visualizing Data"

Q. Why is your book timely? A. Interest in R for data analysis and visualization has exploded in recent years. In the computer-tech world, computers and networks have made it much easier to gather and organize data, and more and more people have recognized that there's useful information to be found. To illustrate, consider the job "data scientist": this is a job title that didn't even exist five years ago, and now it's one of the hottest tickets on the market. At the same time,

there's been a swell of interest in R in its more traditional setting, in science and engineering. I think there are many reasons for this. One, is that there's a growing recognition outside of the computer-programmer world that learning a little programming can save you a lot of time and reduce errors. Another reason is that the last few years have seen an improvement in the user-friendliness of tools for using R. So there's a lot of interest in using R for finding information in data, and visualization an essential tool for doing this. Data visualizations can help you understand your data and find patterns when you're in the exploratory phase of data analysis, and they are essential for communicating your findings to others.

Q. What information do you hope that readers of your book will walk away with? A. As my book is a Cookbook, the primary goal is to efficiently present solutions for visualizing data, without demanding a large investment of time from the reader. For many readers, the goal is to just figure out how to make a particular type of graph and be done with it. There are others who will want to gain a deeper understanding of how graphing works in R. For these readers, I've written an appendix on the graphing package `ggplot2`, which is used extensively in the recipes in the book. This appendix explains some of the concepts in the grammar of graphics, and how they relate to structures common to data visualizations in general. Finally, I hope that readers will find ideas and inspiration for visualizing their data by browsing the pages and looking at the pictures.

Q. What's the most exciting/important thing happening in your space? A. I'm excited that R is becoming more and more accessible to users who don't primarily identify as programmers. Many scientists, engineers, and data analysts have outgrown programs that provide canned data analysis routines, and they're turning increasingly to R. The growing popularity of R is part of a virtuous circle: as R gains a larger user base, it encourages people to create better educational materials and programming tools for R, which in turn helps to grow the number of R users. Technology-wise, I'm excited by Shiny, which is a framework for bringing R analyses to the web. (I should mention that this it's part of my job to work on the development of Shiny.) This makes it possible to build interactive applications for data analysis and visualization for users who don't need to know R, or even that the application is backed by R.

Winston Chang is a software engineer at RStudio, where he works on data visualization and software development tools for R. He holds a Ph.D. in Psychology from Northwestern University. During his time as a graduate student, he created a website called "Cookbook for R", which contains recipes for handling common tasks in R. In previous lives, he was a philosophy graduate student and a computer programmer.

Your R graphics bible. This is very much a recipe book - look for the kind of graph you want and it will give you the working code to get you started. If you don't know what kind of graph you want then browse the book and it will give you some great ideas you might not have thought of. But like a good recipe book it's not just about how to generate graphs in R, it's also a pretty good primer on how to produce good graphs - which is after all what we are trying to do in the first place. Since getting this book I have pretty much stopped making any bar graphs but instead make Cleveland dot plots with line segments, and the people for whom I make the graphs love the change. This book walks you through the essentials of graphing in R: base graphics and ggplot2 as well as a bit about lattice. In addition there is a section on formatting your data which isn't bad for starters. If you use the R help menus in conjunction with the book then most of the time you will do OK.

Even though I am really familiar with ggplot2, plyr and reshape, Winston Chang have some great tricks manipulating data and creating awesome graphics that I had never seen before. The recipe format of this book is great for beginners and advanced users because one can get straight answers without having to read too much.

I have Hadley Wickham's book on ggplot2 - *ggplot2: Elegant Graphics for Data Analysis* (Use R!), which is a great introduction to advanced R graphics. However, since that book was published in 2009, a few updates in R and ggplot2 have made some of the tricks I used for plots obsolete and I've had to refer to the online ggplot2 documentation to update my code. The R Graphics Cookbook makes this task of finding best practices for ggplot2 much easier, and provides some really concrete examples. This R Graphics Cookbook and the ggplot2 book make for a powerful combination.

If you're ever fumbling around with data in R, you're probably familiar with the built-in, unattractive graphics. ggplot2's been increasingly recognized as a necessity for getting the most out of your imagery. It offers nearly complete control over your graphics output, building them layer by layer. I spent a solid year learning and exploring R as a graduate student before I cracked open Winston Chang's R Graphics Cookbook and started learning ggplot2's little oddities. ggplot2 is itself almost like another language within R, but it's thankfully a very simple language -- far more simple and far more flexible, I feel, than the built-in graphics options. Since you'll be printing your graphics step by step -- your boundaries before your lines; your lines separately from points; etc. -- it's easy to keep track of where every impact on the output image is occurring, allowing you to easily tweak the code and get immediate results. E.g., if annotations are not lining up where you want, or font size needs

to be reduced. Chang's cookbook is separated by what feature you need to either edit or create, making it easy to jump to what the reader needs. Full sections are devoted to bar graphs, line graphs, scatter plots, data distribution graphics, customizing annotations, axes, legends, color options, and cetera. Nearly 400 pages of text and images showing different ways of customizing and displaying every piece of your graphics. It's not a book you read cover to cover -- just the resource that 'cookbook' implies, meeting the reader's specific needs. If you want to just jump into the code and see what you can do with your own data, there's no better place to start. Almost no time is devoted to unnecessary exercises or teaching you the fundamentals of the R programming language. Exploring the far reaches of the Internet is a free alternative that's likely just as helpful, but Chang's book serves as a great reference, and contains almost everything you need all in one.

Others have done a great job noting the strong points of this book for R programmers. Those aspects combine with another to help out converts from SAS, like my husband. He likes that there are not only recipes, but underlying reasons. The book provides insight into how R is intended to work. This is the difference between understanding the basic concept of cut-and-paste as opposed to knowing just the steps for doing it in one operating system. He also likes that the explanations provide gobs of useful search terms. These are great for solving challenges not contained in the recipes. Must be a good book. He no longer grouses about how "easy things used to be with SAS," and tends to build complex charts with R now, instead of Libreoffice.

I have been using R on a Linux laptop. I keep statistics for an organization, and I use R to make displays. I worked with it to make displays equal to what I could do in my professional career using software not available to me now. My experience with R is through "R for Dummies", much practice, and using help for R available online. I found myself learning things as I read on page 3. I sat down to read a couple of chapters and then skimmed the book. I am pleased with the authors style of writing and his presentation of the data. It is helpful that he uses some example data sets used in the "R for Dummies" book. Also, the author introduces you to several other R packages that provide useful tools for handling data. In short, I am well pleased with this book, and it will be useful to me.

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