

Contents

	Preface to the third edition	page xv
	Preface to the second edition	xvii
	Preface to the first edition	xix
1	Getting started	1
1.1	What is statistical programming?	1
1.2	Outline of this book	2
1.3	The R package	3
1.4	Why use a command line?	3
1.5	Font conventions	4
1.6	Installation of R and RStudio	4
1.7	Getting started in RStudio	5
1.8	Going further	6
2	Introduction to the R language	7
2.1	First steps	7
2.2	Basic features of R	12
2.3	Vectors in R	13
2.4	Data storage in R	22
2.5	Packages, libraries, and repositories	27
2.6	Getting help	29
2.7	Useful R features	32
2.8	Logical vectors and relational operators	37
2.9	Data frames, tibbles, and lists	40
2.10	Data input and output	46

3	Programming statistical graphics	53
3.1	Simple high level plots	54
3.2	Choosing a high level graphic	67
3.3	Low level graphics functions	68
3.4	Graphics as a language: <code>ggplot2</code>	70
3.5	Other graphics systems	87
4	Programming with R	93
4.1	Flow control	93
4.2	Managing complexity through functions	108
4.3	The <code>replicate()</code> function	114
4.4	Miscellaneous programming tips	115
4.5	Some general programming guidelines	118
4.6	Debugging and maintenance	125
4.7	Efficient programming	132
5	Complex programming in the <i>tidyverse</i>	139
5.1	The <i>tidyverse</i> principles	140
5.2	The <code>tibble</code> package: a data frame improvement	141
5.3	The <code>readr</code> package: reading data in the <i>tidyverse</i>	143
5.4	The <code>stringr</code> package for manipulating strings	144
5.5	The <code>dplyr</code> package for manipulating data sets	146
5.6	Other <i>tidyverse</i> packages	149
6	Simulation	150
6.1	Monte Carlo simulation	150
6.2	Generation of pseudorandom numbers	151
6.3	Simulation of other random variables	156
6.4	Multivariate random number generation	173
6.5	Markov chain simulation	175
6.6	Monte Carlo integration	177
6.7	Advanced simulation methods	179
7	Computational linear algebra	197
7.1	Vectors and matrices in R	198
7.2	Matrix multiplication and inversion	205
7.3	Eigenvalues and eigenvectors	210
7.4	Other matrix decompositions	211
7.5	Other matrix operations	218

8	Numerical optimization	222
8.1	The golden section search method	222
8.2	Newton–Raphson	225
8.3	The Nelder–Mead simplex method	227
8.4	Built-in functions	231
8.5	Linear programming	231
<hr/>		
Appendix A	Review of random variables and distributions	248
<hr/>		
Appendix B	Base graphics details	251
B.1	The plotting region and margins	251
B.2	Adjusting axis tick labels	252
B.3	Setting graphical parameters	255
<hr/>		
	Index	257