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978-0-521-87265-2 - A First Course in Statistical Programming with R
W. John Braun and Duncan J. Murdoch
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A First Course in Statistical Programming with R

This is the only introduction you'll need to start programming in R, the open-source language that is free to download, and lets you adapt the source code for your own requirements. Co-written by one of the R core development team, and by an established R author, this book comes with real R code that complies with the standards of the language.

Unlike other introductory books on the ground-breaking R system, this book emphasizes programming, including the principles that apply to most computing languages, and the techniques used to develop more complex projects. Learning the language is made easier by the frequent exercises within chapters which enable you to progress confidently through the book. More substantial exercises at the ends of chapters help to test your understanding.

Solutions, datasets, and any errata will be available from the book's website.

W. John Braun is an Associate Professor in the Department of Statistical and Actuarial Sciences at the University of Western Ontario. He is also a co-author, with John Maindonald, of *Data Analysis and Graphics Using R*.

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Preface

This text began as notes for a course in statistical computing for second year actuarial and statistical students at the University of Western Ontario. Both authors are interested in statistical computing, both as support for our other research and for its own sake. However, we have found that our students were not learning the right sort of programming basics before they took our classes. At every level from undergraduate through Ph.D., we found that students were not able to produce simple, reliable programs; that they didn't understand enough about numerical computation to understand how rounding error could influence their results; and that they didn't know how to begin a difficult computational project.

We looked into service courses from other departments, but we found that they emphasized languages and concepts that our students would not use again. Our students need to be comfortable with simple programming so that they can put together a simulation of a stochastic model; they also need to know enough about numerical analysis so that they can do numerical computations reliably. We were unable to find this mix in an existing course, so we designed our own.

We chose to base this text on R. R is an open-source computing package which has seen a huge growth in popularity in the last few years. Being open source, it is easily obtainable by students and economical to install in our computing lab. One of us (Murdoch) is a member of the R core development team, and the other (Braun) is a co-author of a book on data analysis using R. These facts made it easy for us to choose R, but we are both strong believers in the idea that there are certain universals of programming, and in this text we try to emphasize those: it is not a manual about programming in R, it is a course in statistical programming that uses R.

Students starting this course are not assumed to have any programming experience or advanced statistical knowledge. They should be familiar with university-level calculus, and should have had exposure to a course in introductory probability, though that could be taken concurrently: the probabilistic concepts start in Chapter 5. (We include a concise appendix reviewing the probabilistic material.) We include some advanced topics in simulation, linear algebra, and optimization that an instructor may choose to skip in a one-semester course offering.

We have a lot of people to thank for their help in writing this book. The students in Statistical Sciences 259b have provided motivation and feedback, Lutong Zhou drafted several figures, and Diana Gillooly of Cambridge University Press, Professor Brian Ripley of Oxford University, and some anonymous reviewers all provided helpful suggestions. And of course, this book could not exist without R, and R would be far less valuable without the contributions of the worldwide R community.