

Preface

This contribution to the useR! series by Springer is designed to show newcomers how to do functional data analysis in the two popular languages, Matlab and R. We hope that this book will substantially reduce the time and effort required to use these techniques to gain valuable insights in a wide variety of applications.

We also hope that the practical examples in this book will make this learning process fun, interesting and memorable. We have tried to choose rich, real-world problems where the optimal analysis has yet to be performed. We have found that applying a spectrum of methods provides more insight than any single approach by itself. Experimenting with graphics and other displays of results is essential.

To support the acquisition of expertise, the “scripts” subdirectory of the companion fda package for R includes files with names like “fdarm-ch01.R”, which contain commands in R to reproduce virtually all of the examples (and figures) in the book. This can be found on any computer with R and fda installed using `system.file('scripts', package='fda')`. The Matlab code is provided as part of the fda package for R. From within R, it can be found using `system.file('Matlab', package='fda')`. It also can be obtained by downloading the .tar.gz version of the fda package for R from the Comprehensive R Archive Network (CRAN, www.r-project.org), unzipping it and looking for the `inst/Matlab` subdirectory.

The contents of a book are fixed by schedules for editing and printing. These script files are not similarly constrained. Thus, in some cases, the script files may perform a particular analysis differently from how it is described in the book. Such differences will reflect improvements in our understanding of preferred ways of performing the analysis described in the book. The web site www.functionaldata.org is a resource for ongoing developments of software, new tools and current events.

The support for two languages is perhaps a bit unusual in this series, but there are good reasons for this. Matlab is expensive for most users, but its for capacity modeling dynamical systems and other engineering applications has been critical in the development of today’s fda package, especially in areas such chemical engineering where functional data are the rule rather than the exception and where Matlab is widely used. On the other hand, the extendibility of R, the easy interface with lower-

level languages, and above all its cost explain its popularity in many fields served by statisticians, students and new researchers. We hope that we can help many of our readers to appreciate the strengths of each language, so as to invest wisely later on. Secondly, we hope that any user of either language wanting to learn the other can benefit from seeing the same analyses done in both languages.

As with most books in this *useR!* series, this is not the place to gain enough technical knowledge to claim expertise in functional data analysis nor to develop new tools. But we do hope that some readers will find enough of value here to want to turn to monographs on functional data analysis already published, such as Ramsay and Silverman (2005), and to even newer works.

We wish to end this preface by thanking our families, friends, students, employers, clients and others who have helped make us what we are today and thereby contributed to this book and to our earlier efforts. In particular, we wish to thank John Kimmel of Springer for organizing this series and inviting us to create this book.

James Ramsay, McGill University
Giles Hooker, Cornell University
Spencer Graves, San Jose, CA



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Ramsay, J.O.; Hooker, G.; Graves, S.

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