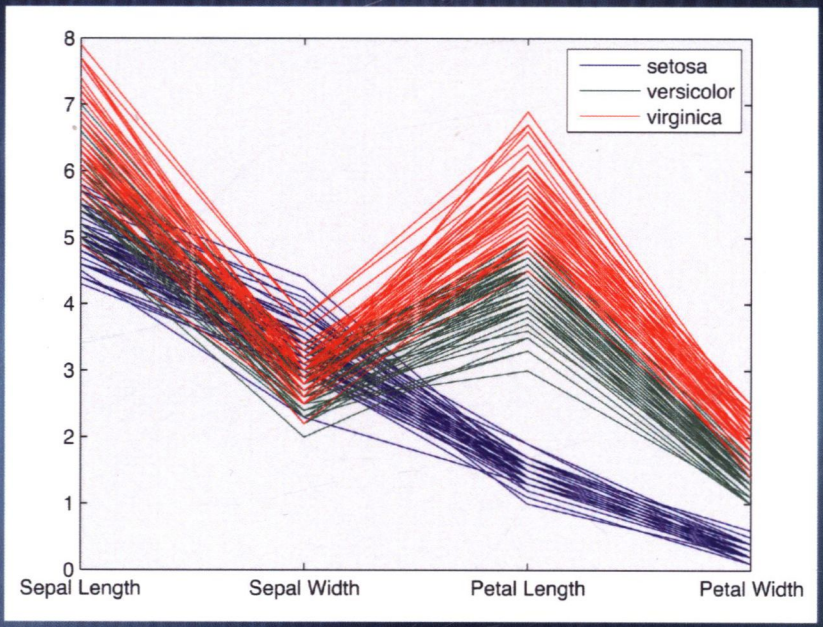
Computer Science and Data Analysis Series

STATISTICS IN MATLAB®

A PRIMER



WENDY L. MARTINEZ
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Statistics

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Fulfilling the need for a practical user's guide, **Statistics in MATLAB: A Primer** provides an accessible introduction to the latest version of MATLAB® and its extensive functionality for statistics. Assuming a basic knowledge of statistics and probability as well as a fundamental understanding of linear algebra concepts, this book:

- Covers capabilities in the main MATLAB package, the Statistics Toolbox, and the student version of MATLAB
- Presents examples of how MATLAB can be used to analyze data
- Offers access to a companion website with data sets and additional examples
- Contains figures and visual aids to assist in application of the software
- Explains how to determine what method should be used for analysis

Statistics in MATLAB: A Primer is an ideal reference for undergraduate and graduate students in engineering, mathematics, statistics, economics, biostatistics, and computer science. It is also appropriate for a diverse professional market, making it a valuable addition to the libraries of researchers in statistics, computer science, data mining, machine learning, image analysis, signal processing, and engineering.

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Wendy dedicates this book to her parents
who started her on this path:

Shirley and Glenn Cukr

MoonJung dedicates this book to her children:

Catherine and Ted

Preface

The functionality in MATLAB® for statistical data analysis has improved and expanded in the past several years, with major changes made in 2012 (version 8). Additionally, MATLAB is frequently used in academia to teach statistics, engineering, mathematics, and data analysis courses. Thus, we felt that a book that provides an overview or introduction to the extensive functionality available in MATLAB would be useful to a wide audience.

The main MATLAB software includes many basic functions for statistical visualization and data analysis. The MathWorks, Inc. Statistics Toolbox extends these basic capabilities by including additional specialized functions. The Statistics Toolbox can be purchased separately. MathWorks also has a Student Version of MATLAB that includes the Statistics Toolbox, as well as many other toolboxes.

One should have the Statistics Toolbox to get the most from this book. However, we include enough content to help those who do not have the extra MATLAB functionality. We have been careful to note where to find the functions—in the base MATLAB or the Statistics Toolbox. If the reader is ever confused about where the function comes from, type

```
which functionname
```

at the command line, and the location of the function file will be displayed.

For example, **normpdf** is a function in the Statistics Toolbox. We get the following, when we type **which normpdf**:

```
C:\MATLAB2013a\toolbox\stats\stats\normpdf.m
```

This is under the directory **~\toolbox\stats**, indicating the function is part of the Statistics Toolbox. A function that is in base MATLAB will have a directory **~\toolbox\matlab**.

It took over a year to write this book and several versions of MATLAB. We started with MATLAB R2013a and finished with MATLAB 2014a. All functions should work with R2013, with a few exceptions. These are found mostly in Chapter 8. We recommend that readers investigate the changes in MATLAB by looking at the release notes that are available in the MATLAB documentation or try to have the latest version installed.

There is a companion website, where the reader can find the data sets, M-files with the code from the book, and additional examples. This website is

```
www.pi-sigma.info
```

You can also download the files from the book website at CRC Press.

For the most part, we assume the reader has a basic knowledge of statistics and probability. The focus of this book is on how to use the statistics capabilities in MATLAB, not on the theory and use of statistics. However, we do include definitions and formulas in certain areas in order to aid the understanding of the MATLAB functions.

The reader should also know some basic concepts of linear algebra. This includes the definitions of vectors, matrices and operations such as adding vectors, multiplying matrices, taking transposes, etc.

Please note that this book is an *introduction*. It is not meant to cover all aspects of statistical analysis nor all of the functions available for statistics in MATLAB. Readers should always refer to the help files and other documentation provided with MATLAB to get the full story. We provide information on how to access the documentation in the first chapter.

We would like to acknowledge the invaluable help of the reviewers: Tom Lane, John Eltinge, Terrance Savitsky, Eungchun Cho, Ted Cho, and Angel Martinez. Their many helpful comments and suggestions resulted in a better book. Any shortcomings are the sole responsibility of the authors. We greatly appreciate the help and patience of those at CRC Press: David Grubbs, Jessica Vakili, Robin Starkes, and Kevin Craig. Finally, we are indebted to Naomi Fernandes, Paul Pilotte, and Tom Lane at The MathWorks, Inc. for their special assistance with MATLAB.

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