be found in many textbooks. I am not that happy with Meyer’s treatment of integration with respect to vector-valued continuous semimartingales, however. This is introduced only as sum of componentwise integrals, a concept of only limited use. Even in a Brownian setting, componentwise stochastic integration is not the right concept in many cases. [Compare example III.4.10 of Jacod and Shiryaev (1987) or the discussion in Chatelain and Strickler (1994), where the authors stress the relevance of this point for finance.]

In the final chapter, the author turns to applications to finance. After the obligatory Black–Scholes price for an European call option is derived, the general market model is introduced. This is the well-known model where the noise source is a $d$-dimensional Brownian motion. Basic concepts such as arbitrage or change of numeraire are carefully introduced. However, I miss a discussion of the very basic notion of market completeness. In fact, incomplete models are not treated at all. Having introduced the market model, Meyer turns to the pricing of derivative securities in this framework. Examples like digital options or options to exchange assets are considered. However, American options are not even mentioned. This seems to be a rather serious omission, because in the real world American-style derivatives are by far the most traded type of options. The last section then is about interest rate derivatives, in the spirit of the so-called “market models.” In particular, Meyer presents valuation formulas in log-Gaussian LBIOR models. Much of the material here can be found in chapters 14–16 of Musiela and Rutkowski (1997).

The bibliography is much too short, containing only 18(!) references. Here the competition is slightly more ahead: for instance, the text of Karatzas and Shreve (1998) has 657 references!

All in all, Continuous Stochastic Calculus With Applications to Finance is carefully written and detailed, but contains only very little new or original material, as the author himself concedes. Thus readers should also take a look at the other books mentioned earlier. However, one interested in a thorough, yet compact introduction into stochastic integration together with a presentation of the very basics in an important application of that theory might take this book into consideration.

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Probability Theory: An Analytic View.
Daniel W. Stroock, New York: Cambridge University Press, 1999. ISBN 0-521-66349-0. xv + 536 pp. $29.95 (P).

Perhaps the most important single question when a new book appears in an established area is: For whom is this book written? Stroock addresses this question in the first paragraph of his Preface, and gives the refreshingly honest answer: himself. The rest of the Preface will reward even the most casual reader with a succinct account of Stroock’s background (the book is dedicated to his teachers Kac, McKean, and Varadhan), and with evidence of a literary merit far beyond that normally found in technical monographs.

The author’s intended audience is indicated in a Foreword, beginning with “This book is intended for graduate students who have a good undergraduate introduction to probability theory, a reasonably sophisticated introduction to modern analysis, and who now want to learn what these two topics have to say about each other.” The book is a goldmine, from which any serious probabilist, whether beginner or graybeard, will benefit, but it is by no means an easy read. This would no doubt be still more so were it not for the moderating influence of Persi Diaconis, gratefully acknowledged: “Persi lobbied for a kinder, gentler book; and for this, my readers owe him a considerable debt of gratitude.” Indeed we do.

Stroock’s natural academic habitat (like that of this reviewer) is the interface between probability and analysis. As he remarks in his Preface, “I am not a dyed-in-the-wool probabilist (i.e., what Donsker would have called a true coin-tossers).” One pleasure the book affords is the chance to place oneself on this probability/analysis scale. (To give a personal view, I consider myself fairly analytical as probabilists go, but less so than Stroock.)

Much of the material is standard enough; the ordering and the treatment are less so and are often highly individual. Chapter I on sums of independent random variables, treats the weak and strong laws and the law of the iterated logarithm. Chapter II is on the central limit theorem, Chapter III treats the Lévy–Khintchine formula and Lévy processes, and Chapter IV treats Wiener measure (Gaussian and Markovian aspects). Conditioning makes an amazing related appearance in Chapter V. Chapter VI on applications of martingale theory, treats (very well) a topic unique to this book at this level, to my knowledge: the Calderón–Zygmund–Stein theory of singular integrals and its relatives in the Burkholder-Gundy theory of martingales, martingale transforms, and so forth. This is perhaps the book’s most distinctive chapter; its attractions to probabilists is its insights (e.g., Paley–Wiener theory) into the singular integral–martingale interface and, to statisticians, its relevance to wavelets (not mentioned in the book). Chapter VII is on martingales and diffusions, with the Stroock–Varadhan martingale problem approach unobtrusively informing the treatment. Chapter VIII is on potential theory, both classical and (to a lesser extent) probabilistic.

One could carp at the selection, ordering, or treatment of some material. I prefer not to: the author declares his hand openly and honestly in advance, and the individuality of his choice is a strength rather than a weakness. What irritated me most was the use of $\int$ in place of $\int$ throughout, and the use of footnotes rather than a bibliography for references. But these are quibbles. This is a fine book, which will well reward the considerable effort needed to read it.

A number of distinguished probabilists have written one-volume-single-author books on probability at the graduate level (Billingsley, Breiman, Chung, Dudley, Kallenberg, and Shiryaev, to name but the first six who come to mind). The challenge for those seeking to join this distinguished company is to write comparably well and to say something new and distinctive—to be individual, without being too idiosyncratic. Stroock succeeds here admirably, and it is a pleasure to see this fascinating book now available in paperback, so that the author’s many admirers can buy their own copy.

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Robust Diagnostic Regression Analysis.
Anthony Atkinson and Marco Riani. New York: Springer, 2000. ISBN 0-387-95017-6. xvi + 328 pp. $79.95.

This book presents and develops a new method for “robust” regression and related data analysis. Because the book is based on the author’s “forward search” method, the usefulness of the book depends on the usefulness of the method. The basic idea is as follows. Based on a robust fit to the data, a $p$ point subset is chosen as the starting subset. With very high probability, this subset of the data will not contain any outliers. With minimal assumptions, the least squares (LS) estimator will fit these $p$ points exactly. The next step is to add one additional point to the starting $p$ points. The point that increases the error sum of squares for the $p$ points the least is added. Next, the LS fit to the $p+1$ points is computed. Then the residuals for the entire dataset are evaluated at the LS fit to the $p+1$ points. The $p+1$ points with smallest sum of squared residuals determine the first iteration (from $p$ to $p+1$ points) of the forward search methods. Iterations continue in the same way until all $n$ points have been selected. The authors develop a series of plots based on each iteration, for example, the subset size on the $x$-axis and the $s_2$ on the $y$-axis. A more complicated plot has the same $x$-axis, but the scaled residuals for each data point on the $y$-axis. Of course, such a plot would not be useful
for a large dataset. The authors show, via examples, that their plots are useful for detecting interesting features in some datasets.

Chapter One presents three easy-to-follow examples to introduce the method. All chapters end with some exercises and their solutions. A reasonable linear algebra background is required to solve some of the exercises; others are more applied. Most chapters also include a section on further reading.

Chapter Two starts with a brief review of regression diagnostics, then presents a more detailed description of the forward search method. Chapter Three presents four more complicated regression analyses.

Chapter Four deals with transformations to normality in regression. A forward search plot of the score statistic for the Box–Cox power transformation for each iteration for various values of \( \lambda \) is shown to be useful in examples. Transformations of explanatory variables and transform both sides (Carroll and Ruppert 1988) are also discussed.

Chapters Five and Six introduce forward search plots for nonlinear regression and generalized linear models via several examples. Code for forward search plots are available in S-PLUS at http://stat.cmm.unipr.it/riani/ar.

Although the theoretical properties of the authors’ forward search methods have not been investigated, it appears clear that the method is useful in practice. Theoretical consideration could lead to minor modifications, but these modifications would likely have little effect on the plots.

I would recommend Robust Diagnostic Regression Analysis and tools for anyone who does a fair amount of applied regression analysis on small- to moderate-sized datasets. It would be especially useful for anyone who uses nonlinear regression and/or generalized linear regression, where many fewer diagnostic tools are available. As a textbook, it would be good as a supplemental or even a primary text in a masters-level regression course. Researchers in other fields who do their own regression analysis also should be referred to this text, which they will find quite understandable.

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Interpolating Cubic Splines.

Gary D. Knott. Boston: Birkhäuser, 2000. ISBN 0-8176-4100-9, xii + 244 pp. $49.95.

This book is intended as a reference book for engineers and computer scientists interested in spline interpolation to exact data. The cubic splines are treated in depth with a wide variety of explicit approaches including Hermite splines, double-tangent splines, natural splines, and geometrically continuous splines. Some less commonly addressed topics, such as cardinal splines, monotone splines, and physical splines, are also covered. The author requires only elementary calculus and linear algebra of the reader. A review of the differential geometry of curves, along with exercises and computer programs, are provided.

Statisticians dealing with random errors are more interested in smoothing rather than interpolating data. This book has only one chapter (10) with seven pages on smoothing splines. Therefore, readers expecting an introduction to spline smoothing are apt to be disappointed, and may find the books by DeBoor (1978), Eubanks (1999), Green and Silverman (1994), Gu (2002), Schumaker (1981), and Wahba (1990) more relevant.

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Practical Optimization Methods With Mathematica Applications.

M. Ashgar Bhatti. New York: Springer, 2000. ISBN 0-387-98631-6, xiii + 715 pp. $79.95.

Optimization Foundations and Applications.

Ronald E. Miller. New York: Wiley, 2000. ISBN 0-471-35169-5, xvii + 653 pp. $89.95 (P).

These two texts on optimization methods are intended for roughly the same market: “undergraduate and graduate students in engineering, operations research, management information systems” (Bhatti) and “students from and practitioners in a wide variety of disciplines outside the natural sciences . . . regional sciences, sociology, geography, political science, and economics” (Miller). They also cover approximately the same topics: linear equations, unconstrained optimization, linear programming, quadratic programming, and constrained nonlinear optimization. Both texts present the mathematical material somewhat informally, relying on numerous low-dimensional examples in which graphical presentations aid in developing intuition and understanding. Bhatti’s text has an accompanying CD with a Mathematica-based optimization toolbox. The functions in the toolbox are written so that various intermediate results can be displayed to aid understanding of the different methods. Miller’s text is somewhat less computer-oriented in the sense that there is no reliance on a specific computer language or optimization package. My general sense is that Miller’s text is slightly more oriented toward explaining ideas behind the various methods, whereas Bhatti’s is slightly more oriented toward gaining practical experience with a variety of methods. Both texts, however, place substantial emphasis on both ideas and practice, so the difference may not be particularly great.

Both texts have numerous exercises at the end of each chapter. Bhatti’s typically has more problems than Miller’s, and the problem selection also reflects the slightly different emphasis on the idea–practicum scale.

Another similarity in the two texts is the lack of material on dynamic optimization techniques such as calculus of variations, optimal control theory, dynamic programming, and Monte Carlo Methods.

Both texts are well written and cover material that is very useful to statistics students and practitioners. I have a preference for Miller’s idea-oriented approach, but either text would be a useful addition to a reference shelf.

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Genetic Algorithms.

K. F. Man, K. S. Tang, and S. Kwong. London: Springer-Verlag, 1999. ISBN 1-85233-072-4, vii + 344 pp. $54.95 (P).

This book is part of the Springer series of Advanced Textbooks in Control and Signal Processing. The authors’ stated intent is to provide information that can be easily assimilated by the reader to put that knowledge “to good practical use.” They proceed toward this end by developing genetic algorithms (GAs) in four chapters (74 pages) and describing applications in the subsequent six chapters (236 pages). In addition to 209 illustrations in the body of the text, there are six short mathematical appendices, an extensive bibliography, and an index.

The authors begin with a strong biological motivation for GAs. The first two chapters draw upon genetic principles (the Preface correctly identifies the English philosopher Herbert Spencer as the originator of the phrase “survival of the fittest”). This biological view continues in the next two chapters as the authors introduce the concepts of parallel and hierarchical genetic algorithms. The remaining chapters present engineering applications. Chapter 5 (Genetic Algorithms in Filtering) and Chapter 8 (Genetic Algorithms in Speech Recognition Systems) have the closest correlation with statistical applications. However, there are few references to statistical issues as such.

This is a well-written engineering textbook. Genetic algorithms are properly explained and well motivated. The engineering examples illustrate the power of application of genetic algorithms. Because it offers few connections with statistical principles, however, I see no reason for this book to be in the library of most practicing statisticians.

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