Applications of Mathematics

Book Reviews

Applications of Mathematics, Vol. 46 (2001), No. 6, 479--480

Persistent URL: http://dml.cz/dmlcz/134479

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BOOK REVIEWS

P. I. Good: RESAMPLING METHODS. A PRACTICAL GUIDE TO DATA ANALYSIS. Birkhäuser-Verlag, Boston-Basel-Berlin, 1999, xii + 269 pages, 35 figs., ISBN 3-7643-4091-6, price DM 138.–.

Only the most basic mathematical background is required for reading this guide to statistical data analysis. The procedures of estimating, hypothesis testing and data classification are simply explained and step by step demonstrated by resampling various selected data through permutation, cross-validation and bootstrap. No proofs are included of presented methods but the emphasis is put on the intuitive statistical understanding, which is systematically developed by witty examples of correct reasoning as well as of misconceptions concerning the true meaning of basic statistical notions in the most common situations.

The first five chapters (entitled Descriptive statistics, Cause and effect, Testing hypothesis, When the distribution is known, Estimation) can be regarded as an elementary course on statistics governed by the idea that "the best way to review and understand statistics is to take some data (collected or borrowed) and apply the techniques in this book" (p. 7). And indeed, there is perhaps no statement in the book without a specific data sample demonstrating its strength and mentioning its possible misuse in common people life, advertising practice, politics, science etc.

Chapter 6 (Power of test) considers the errors involved in statistical testing and the interrelations between the power, sample size and significance level, in particular with respect to the resampling procedures. Chapter 7 deals with categorical data; several statistics (Fisher's exact test, Freeman-Halton statistics, Pitman's correlation, linear-by-linear association etc.) are compared to one another.

Experimental design is treated in the next chapter; balancing of extraneous factors, block of factors under control, use of Latin squares and bookstrap applications are included between other topics. The following three chapters are rather informative. Only the essentials of multivariate analysis are mentioned in Chapter 9. The briefly covered matters are classification, discrimination density estimation—Chapter 10, survival analysis and reliability with a special attention devoted to the manipulation with censored data—Chapter 11.

The last chapter provides the reader with an expert system for use in choosing an appropriate estimation or testing technique. Four appendices summarize knowledge on statistical programming, in particular C++, SC and Stata Code for permutation tests, and SAS, S-PLUS Code for bootstraps.

Each chapter is concluded by a very short summary followed by an extensive guide to recent literature (the total number of references exceeds 400). The substantial part of the book consists in numerous exercises taken similarly as the examples in the text mainly from biology, medicine, psychology and public health. A software related to them can be downloaded from the author's home page `http://users.oco.net/drphilgood/`; it also includes some of the examined large data sets to spare the reader the effort of retyping.

The book is intended for class use or self-study and can be used by advanced students as a first course in statistics. For industrial statisticians, statistical consultants and research workers, it provides an introductory course on resampling methods. Moreover, the reviewer believes that at least some parts of the book can be interesting for anybody wishing to face up to the overflow of statistical information and its frequently incorrect interpretations.

Ivan Saxl

T. N. Atanackovic, A. Guran: THEORY OF ELASTICITY FOR SCIENTISTS AND ENGINEERS. Birkhäuser-Verlag, Basel-Boston-Berlin, 1999, 392 pages, ISBN 3-8176-4072, price DM 148,–.

The book provides a modern introduction to elasticity theory accessible for readers in mechanical engineering, students, and other professionals in all areas of science and engineering.

The text follows the up-to-date presentation of the topic including the aspect of nonlinear stress. The text covers the one-dimensional Hooke's law as well as its three-dimensional generalizations and the influence of geometric nonlinearity on finite deformations in the linear stress state. Numerous examples and problems are given and solved by methods of complex analysis.

The main topics include a detailed analysis of stress and strain, Hooke's law in one and three dimensions, Lamé equations and other boundary value problems of elasticity theory, plane strains and stresses, the elementary plate theory, contact problems, and elastic stability.

The book is an essential introductory text in the theory of elasticity, the organization is logical, the exposition clear and illustrated by numerous examples. It is suitable also for self-study purposes in all relevant areas of applied science and engineeering.

Eduard Feireisl

A. Böttcher, S. M. Grudsky: TOEPLITZ MATRICES, ASYMPTOTIC LINEAR ALGEBRA, AND FUNCTIONAL ANALYSIS. Birkhäuser-Verlag, Basel-Boston-Berlin, 2000 (ISBN 3-7643-6290-1) and Hindustan Book Agency, New Delhi, 2000 (ISBN 81-85931-24-0). Paperback, x+116 pages, price DM 58,–.

This small book is a very nice introduction to some problems concerning the approximation of a Toeplitz matrix by its principal submatrices. Recall that for an essentially bounded measurable function a on the unit circle, the corresponding Toeplitz matrix $T(a)$ is $[\hat{a}_{i-j}]_{i,j=0}^{\infty}$, where $\hat{a}_j$ are the Fourier coefficients of a. Let $T_n(a) = [\hat{a}_{i-j}]_{i,j=0}^{n-1}$ be the $n \times n$ principal submatrix of $T(a)$. The authors study the convergence of the norms, the norms of the inverses, the inverses themselves, the spectra, the pseudospectra, and the singular values of $T_n(a)$ to those of $T(a)$ as $n \to \infty$. The basic facts concerning these are established in Chapter 2, after presenting some introductory material (basic properties of Toeplitz operators, basics of C^*-algebras and Fredholm theory) in Chapter 1. Chapter 3 is concerned with the speed of divergence of $\|T_n(a)^{-1}\|$ to infinity for non-invertible $T(a)$. Chapter 4 discusses the rate of convergence of the norms $\|T_n(a)\|$, the norms of the inverses $\|T_n(a)^{-1}\|$, and the condition numbers $\kappa(T_n(a)) = \|T_n(a)\|\,\|T_n(a)^{-1}\|$ to $\|T(a)\|$, $\|T(a)^{-1}\|$ and $\kappa(T(a))$, respectively, for invertible $T(a)$. Finally, in Chapter 5 the limiting behaviour of the singular values is investigated, both the individual limits of $s_k(T_n(a))$ and $s_{n-k}(T_n(a))$ as k is fixed while $n \to \infty$, and the asymptotic distribution of the singular values (i.e. the limits of the spectra $\sigma(|T_n(a)|)$ as n tends to infinity—the Szegö limit theorem, the Avram-Parter theorem, etc.).

The book is fairly self-contained, the reader is required to have only the command of linear algebra and functional analysis up to rudiments of C^*-algebra theory. In the reviewer's opinion, this is a good introduction into the subject for beginners, while handsome enough to appeal also to specialists in the area.

Miroslav Engliš