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Book Reviews

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BOOK REVIEWS

S. Panchapakesan, N. Balakrishnan, eds.: ADVANCES IN STATISTICAL DECISION THEORY AND APPLICATIONS. Birkhäuser Verlag, Boston-Basel-Berlin, 1997, 1+448 pages. ISBN 3-7643-3965-9, price DM 168.–

A twin volume to *Advances in combinatorial methods and applications to probability and statistics* reviewed in this issue (see below)—the same arrangement, cover, extent, written by 50 invited expert authors and dedicated to another prominent Indian statistician Shanti S. Gupta in honor of his pioneering contributions to ranking and selection theory. As editors stress in the preface, “the volume is not a proceedings but a carefully planned volume consisting of articles consistent with the clearly set editorial goals”, namely to review recent developments, to discuss their applications and to indicate directions for further research. 28 chapters are organized into seven parts:

- I. Bayesian inference: 6 chapters on Bayesian estimation and selections for normal, Bernoulli, exponential, uniform and multivariate hypergeometric populations with an introductory chapter on Bayesian approach.
- II. Decision theory: 2 chapters on adaptive multiple decision procedures (exponential families) and on the construction of non-informative priors via sieves and packing numbers.
- III. Point and interval estimation: 5 chapters on expectation validity, asymptotic theory for SIMEX (*simulation and extrapolation*) error estimator, change point method (with a special regard to the case of filaments bundle strength), bias reduction in nonparametric regression estimation and on multiple comparisons.
- IV. Tests of hypotheses: 4 chapters covering modified Bayesian-Frequentist test, likelihood ratio and intersection-union tests, multiple decision procedures for testing homogeneity and a comparison of standard tests for $H_0: \theta = 0$ against $H_1: \theta > 0$.
- V. Ranking and selection: 3 chapters on multivariate selection, on selection from normal population with common known variance (integrated indifference zone and subset selection approaches) and on applications of majorization inequalities to ranking and selection.
- VI. Distribution and applications: 3 chapters on correlation analysis of ordered observations with a direct application in vision research, on inference problems connected with “almost lack of memory” property and periodic failure rate and on coupon collector problem, bingo games and Venn diagrams.
- VII. Industrial applications: 5 chapters on statistical process control (control charts for autocorrelated data), reconstruction of missing data by a generalization of the competing risk model, subset selection for binomial population and in combined-array experiments (in relation to quality control) and on predictions based on progressively censored samples.

Summarizing, the book can be recommended to statisticians working in the area of decision theory and its applications. In comparison with the above mentioned twin volume, greater attention is paid to theory and methodology than to immediate applications.

Ivan Saxl

N. Balakrishnan, ed.: ADVANCES IN COMBINATORIAL METHODS AND APPLICATIONS TO PROBABILITY AND STATISTICS. Birkhäuser Verlag, Boston-Basel-Berlin, 1997, xxxiv + 562 pages. ISBN 3-7643-3908-X, price DM 178.–

The huge volume containing 32 papers was written by 45 invited specialists with the aim to review and highlight new results in the applications of combinatorial methods in probability and statistics, and is dedicated to Sri Gopal Mohanty for his pioneering contributions to the lattice path counting.

The present short review can contain hardly more than a simple enumeration of chapter titles and of the prevailing topics included in them, but perhaps even this will be sufficient to raise interest in theoreticians, specialists working in many-faced applications as well as in students and university teachers.

First chapter “Lattice paths and combinatorial methods” is concerned mainly with various problems and techniques of lattice path enumeration including path turns, intersections and crossings, ballot problems and urn models, and with the description of the tools like Faber and Sheffer polynomials, umbral calculus etc. Direct applications to the Kolmogorov-Smirnov test, tossing games, determinantal rings and random walks are discussed in detail.

Various ballot problems and random walks dominate the second chapter. Applications to probability problems, but also record statistics, network reliability and percolation together with miscellaneous recreational problems are tackled. The titles of the next two chapters—Application to urn models (III) and to queueing theory (IV)—are self-explanatory. The reader will be impressed by the wide range of applications in population biology, statistical physics, thermodynamics etc. of the urn model. From the papers of the IVth chapter, at least the extensive review on advances in the analysis of polling systems deserves to be mentioned explicitly.

The Vth chapter contains papers dealing with waiting times and problems connected with enumeration of success and failure runs are presented usually (but not exclusively) in the context of Markov chains. Applications to distribution theory—chapter VI—cover problems from statistical physics, learning process and its models, generalized Euler and q -logarithmic distributions. The closing chapter contains three papers on nonparametric statistics: linear nonparametric tests, analysis of variance and limit theorems for M -processes via rank statistics.

The number and nature of the above cited problems and applications is the best recommendation of this volume; moreover, reader’s orientation is greatly facilitated by an exhaustive subject index.

Ivan Saxl

J. Escher, G. Simonett, eds.: TOPICS IN NONLINEAR ANALYSIS. (Progress in Nonlinear Differential Equations and their Applications, Vol. 35). The Herbert Amann Anniversary Volume. Birkhäuser, Basel-Boston-Berlin, 1998, pp. x + 744. ISBN 3-7643-6016-X, price 228.– DM.

This volume is dedicated to Herbert Amann on the occasion of his sixtieth birthday. It collects 31 research papers written by distinguished and accomplished mathematicians and reflects his wide-ranging interest and influence in various fields of analysis.

The contributions deal with various types of largely semilinear and nonlinear elliptic and parabolic equations, abstract evolution and functional equations, fluid dynamics, functional calculus of unbounded operators, Fourier analysis, hysteresis operators and theory of function spaces. Qualitative properties of solutions, regularity, long-time behaviour, stability and bifurcation as well as nonlinear boundary-value problems, number of solutions, heteroclinics and evolution of curves and surfaces are investigated.

Contributors: A. Ambrosetti, W. Arendt, M. Badiale, T. Bartsch, Ph. Bénilan, Ph. Clément, E. Fašangová, M. Fila, D. de Figueiredo, G. Gripenberg, G. da Prato, E. N. Dancer, D. Daners, E. DiBenedetto, D. J. Diller, J. Escher, G. P. Galdi, Y. Giga, T. Hagen, D. D. Hai, M. Hieber, H. Hofer, C. Imbusch, K. Ito, P. Krejčí, S.-O. Londen, A. Lunardi, T. Miyakawa, P. Quittner, J. Prüss, V. V. Pukhnachov, P. J. Rabier, P. H. Rabinowitz, M. Renardy, B. Scarpellini, B. J. Schmitt, K. Schmitt, G. Simonett, H. Sohr, V. A. Solonnikov, J. Sprekels, M. Struwe, H. Triebel, W. von Wahl, M. Wiegner, K. Wysocki, E. Zehnder, S. Zheng.

Hana Petzeltová

Robert J. Adler, Murad S. Taqqu, eds.: A PRACTICAL GUIDE TO HEAVY TAILS. STATISTICAL TECHNIQUES AND APPLICATIONS. Birkhäuser Verlag, Basel-Boston-Berlin, 1998, xvi + 534 pages. ISBN 3-7643-3951-9, price DM 128.–

The book grew from a successful small workshop held in Santa Barbara in December 1995. The object of the meeting was the statistical analysis of the so-called “bad” data, the distribution of which converges more slowly ($P(X > x) \propto x^{-\alpha}$ as $x \rightarrow \infty$, $0 < \alpha < 2$, say) than standard distributions of the exponential type. The easily accessible style of the book attempts to contact specialists in very different disciplines in whose framework the techniques for the analysis of such data have been developed, published and, unfortunately, rather scattered.

The book includes 24 papers divided into seven chapters. The introductory chapter on applications demonstrates the occurrence of heavy-tailed data in the actual areas of computer working (size distributions and transmission times on the Web) and of the financial and insurance modelling (e.g. the underestimation of risks when using Gaussian assumptions, the distributional form of returns of financial assets, risk management in connection with extremal events like the collapse of sea dikes in the Netherlands, 1953, or the explosion of the Space Shuttle Challenger, 1986).

The next chapter comprises six papers on the time series analysis for heavy-tailed data: Box-Jenkins modelling and parameter estimation in the stable setting, estimating and Bayesian inference in finite and infinite variance time series etc. The IIIrd chapter is concerned with tail index estimation (bootstrapped and jackknifed version of Hill estimator against empirical characteristic function approach—two papers), whereas two papers of the following chapter are devoted to the regression problem and suitable techniques for its solving in the case of heavy-tailed data. The topic of the Vth chapter (two papers) is statistical signal processing in the cases of data being “impulsive in nature” (the presence of sharp spikes, occasional bursts and heavy outliers) and not tractable by exponential distributions (data produced by radar sensors and sonar returns, describing network traffic, call holding times etc.).

Three papers of the VIth chapter describe selected models of heavy-tailed data, namely subexponential distributions, stationary Lévy-stable processes and shot-noise models with potential applications in financial modelling. The book is closed by four papers related to numerical aspects.

The book is an excellent introduction to statistics of heavy-tailed data and distributions and it is intended for a wide audience. It can also serve as a reference book on the recent literature and also as a survey of areas in which heavy-tailed approach is forced by the nature of data. It is quite exciting just to read the titles of references in which besides the already mentioned topics also earthquakes, teletraffic, electromagnetic interference, housing prices, sedimentary formations, telephone noise, long-memory processes and Ireland wind’s power resources can be found. The editors noted in their Preface that “many of the questions posed in the individual papers will require heavy theoretical analysis to be fully covered”.

Hence the book can be appreciated not only by those already working in the encompassed areas but also by theoreticians, namely as a valuable inspiration.

Ivan Šarl

P. K. Kythe: COMPUTATIONAL CONFORMAL MAPPING. Birkhäuser, Boston, 1998, 166 pages. ISBN 3-7643-3996-9, DM 148,-.

The book represents the introduction to the theory and computation of conformal mapping of simply connected regions onto the unit disk or multiply connected regions onto canonical regions. The book is divided into 14 chapters. Chapter 1 and Chapter 2 provide a review of the theory of conformal mapping and Schwartz-Christoffel transformations to map a polygon onto the upper half-plane. The computation of improper Schwartz-Christoffel integrals is studied in Chapter 3. Chapter 4 explains the methods of polynomial approximations for the minimum area problem and for the minimum boundary problem. Nearly circular regions are studied in Chapter 5 through the method of infinite systems and successive approximations. The Dirichlet and the Neumann problems are studied by techniques of numerical evaluation of Grenn's function in Chapter 6. Chapter 7 presents Lichtenstein's, Gershgorin's, Carrier's, Banin's and Warschawski-Siefel's integral equations. Chapter 8 deals with Theodorsen's integral equation. Chapter 9 discusses Symm's integral equation for interior and exterior regions. Chapter 10 is devoted to airfoils. Doubly connected regions are studied in Chapter 11. Chapter 12 is devoted to corner singularities on the boundary and pole-type singularities of the mapping function near the boundary in simply and doubly connected regions. Chapter 13 deals with multiply connected regions. Grid generation is presented in Chapter 14.

Dagmar Medková

Daniel W. Stroock: A CONCISE INTRODUCTION TO THE THEORY OF INTEGRATION. Third Edition, Birkhäuser, Boston, 1999, xiv+253 pages. ISBN 0-8176-4073-8, price DM 58,-.

The great number of commendatory reviews of D. W. Stroock's *Concise introduction to the theory of integration* that have already appeared makes any further review essentially redundant. The sole fact that three editions of this textbook appeared within ten years is sufficiently eloquent.

Nonetheless, let us try to summarize the main merits of the book under consideration. *Concise introduction* is a course of the Lebesgue integration theory at a graduate level, oriented more on interactions with the classical advanced calculus than on the general measure theory. Well organized and lucid presentation with many unusual features makes it possible to cover in a slim book surprisingly rich material and to include important topics which are too often omitted in elementary textbooks (as e.g. a rigorous construction of a surface measure on a smooth surface in \mathbb{R}^N and the proof of the divergence theorem). Nontrivial additional information is contained in copious exercises. Solutions to some of them were included already in the second edition of the book (as the author says in his preface, "at the behest of my students"), now, solutions to all exercises are provided. Another remarkable change in the third edition is a new chapter on the Fourier transform.

Last but not least, the moderate price is also one of the merits of the book.

Ivo Vrkoč