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The *Quarterly of Applied Mathematics* prints original papers in applied mathematics which have an intimate connection with applications. It is expected that each paper will be of a high scientific standard; that the presentation will be of such character that the paper can be easily read by those to whom it would be of interest; and that the mathematical argument, judged by the standard of the field of application, will be of an advanced character.

In accordance with their general policy, the Editors welcome particularly contributions which will be of interest both to mathematicians and to scientists or engineers. Authors will receive galley proof only. The author's institution will be requested to pay a publication charge of $30 per page which, if honored, entitles the author to 100 free reprints. Detailed instructions will be sent with galley proofs.

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SUGGESTIONS CONCERNING THE PREPARATION OF MANUSCRIPTS FOR THE QUARTERLY OF APPLIED MATHEMATICS

The editors will appreciate the authors' cooperation in taking note of the following directions for the preparation of manuscripts. These directions have been drawn up with a view toward eliminating unnecessary correspondence, avoiding the return of papers for changes, and reducing the charges made for "author's corrections."

Manuscripts: Manuscripts should be typewritten double-spaced on one side only. Marginal instructions to the typesetter should be written in pencil to distinguish them clearly from the body of the text. The author should keep a complete copy.

The papers should be submitted in final form. Only typographical errors should be corrected in proof; composition charges for any major deviations from the manuscript will be passed on to the author.

Titles: The title should be brief but express adequately the subject of the paper. The name and initials of the author should be written as he/she prefers; all titles and degrees or honors will be omitted. The name of the organization with which the author is associated should be given in a separate line following his/her name.

Mathematical Work: As far as possible, formulas should be typewritten; Greek letters and other symbols not available on the average typewriter should be inserted using either instant lettering or by careful insertion in ink. Manuscripts containing pencilled material other than marginal instructions to the typesetter will not be accepted.

The difference between capital and lower-case letters should be clearly shown; care should be taken to avoid confusion between zero (0) and the letter O, between the numeral one (1), the letter l and the prime ($'$), between alpha and a, kappa and k, mu and u, nu and v, eta and n.

The level of subscripts, exponents, subscripts to subscripts, and exponents to exponents should be clearly indicated.

Single embellishments over individual letters are allowed; the only embellishment allowed above groups of letters is the overbar.

Double embellishments are not allowed. These may be replaced by superscripts following the symbols.

Complicated exponents and subscripts should be avoided. Any complicated expression that recurs frequently should be represented by a special symbol.

For exponentials with lengthy or complicated exponents the symbol exp should be used, particularly if such exponentials appear in the body of the text. Thus,

$$\exp[(a^2 + b^2)^{1/2}] \text{ is preferable to } e^{[a^2+b^2]^{1/2}}.$$

Fractions in the body of the text and fractions occurring in the numerators or denominators of fractions should be written with the solidus. Thus,

$$\frac{\cos(x/2b)}{\cos(a/2b)} \text{ is preferable to } \frac{\cos\frac{x}{2b}}{\cos\frac{a}{2b}}.$$

In many instances the use of negative exponents permits saving of space. Thus,

$$\int u^{-1}\sin u\,du \text{ is preferable to } \int \frac{\sin u}{u}\,du.$$

Whereas the intended grouping of symbols in handwritten formulas can be made clear by slight variations in spacing, this procedure is not acceptable in typeset formulas. To avoid misunderstanding, the order of symbols should therefore be carefully considered. Thus,

$$(a + bx)\cos t \text{ is preferable to } \cos t(a + bx).$$

Figures: Figures should be drawn in black ink with clean, unbroken lines; do not use ball point pen. The paper should be of a nonabsorbant quality so that the ink does not spread and produce fuzzy lines. If the figures are intended for reduction, they should be drawn with heavy enough lines so that they do not become flimsy at the desired reduction. The notation should be of professional quality and in proportion for the expected reduction size. Figures that are unsuitable for reproduction will be returned to the author for redrawing. Legends accompanying figures should be written on a separate sheet.

Bibliography: References should be grouped together in a Bibliography at the end of the manuscript. References in text to the Bibliography should be made by numerals between square brackets.

The following examples show the desired arrangements: (*for books* S. Timoshenko, *Strength of Materials*, vol. 2, Macmillan and Co., London, 1931, p. 237; *for periodicals* Lord Rayleigh, *On the flow of viscous liquids, especially in three dimensions*, Phil. Mag. (5) 36, 354 372 (1893)). Note that the number of the series is not separated by commas from the name of the periodical or the number of the volume.

Authors' initials should precede their names rather than follow them.

In quoted titles of books or papers, capital letters should be used only where the language requires this. Thus, *On the flow of viscous fluids* is preferable to *On the Flow of Viscous Fluids*, but the corresponding German title would have to be rendered as *Über die Strömung zäher Flüssigkeiten*.

Titles of books or papers should be quoted in the original language (with an English translation added in parentheses, if this seems desirable), but only English abbreviations should be used for bibliographical details such as ed., vol., no., chap., p.

Footnotes: As far as possible, footnotes should be avoided. Footnotes containing mathematical formulas are not acceptable.

Abbreviations: Much space can be saved by the use of standard abbreviations such as Eq., Eqs., Fig., Sec., Art., etc. These should be used, however, only if they are followed by a reference number. Thus, "Eq. (25)" is acceptable but not "the preceding Eq." Moreover, if any one of these terms occurs as the first word of a sentence, it should be spelled out.

Special abbreviations should be avoided. Thus "boundary conditions" should always be spelled out and not be abbreviated as "b.c." even if this special abbreviation is defined somewhere in the text.

CONTENTS

Vol. LX, No. 2 **June 2002**

Turbulent Combustion. By Norbert Peters, Cambridge University Press, 2000, xvi+304 pp., $69.95

This is a volume in the series Cambridge Monographs on Mechanics. In technical processes, combustion nearly always takes place within a turbulent rather than a laminar flow field, since turbulence increases the mixing processes and thereby enhances combustion and since combustion releases heat and thereby generates flow instability by buoyancy and gas expansion, thus enhancing the transition to turbulence. This monograph addresses gaseous turbulent flows at low Mach numbers. There are four chapters: in chapter 1 (turbulent combustion: the state of the art), after a general introduction, the more prominent current modeling approaches for turbulent flow with combustion are presented. In chapter 2 (premixed turbulent combustion) emphasis is placed on a combustion model that uses the level set approach to determine the location of the premixed flame surface. In chapter 3 (nonpremixed turbulent combustion) emphasis is placed on models that are based on the mixture fraction as independent variable. In chapter 4 (partially premixed turbulent combustion) the classical problem is flame stabilization at the lift-off height in a turbulent jet diffusion flame, which is discussed in detail.

Average Case Analysis of Algorithms on Sequences. By Wojciech Szpankowski, John Wiley and Sons, 2001, xxii+551 pp.

This is a volume in the Wiley-Interscience Series in Discrete Mathematics and Optimization. It is a textbook intended for graduate students in computer science, discrete mathematics, information theory, applied mathematics, applied probability, and statistics, as well as a reference for researchers in these fields. It consists of three parts: Part I (Problem on Words: chapters 1–2) describes a class of algorithms and formulates probabilistic and analytic models for it, Part II (chapters 3–6) is devoted to probabilistic and combinatorial methods and Part III (chapters 7–10) to analytic techniques. Chapter 1 discusses the algorithms and data structures on words studied in the book; chapter 2 builds probabilistic models on sequences that are used throughout the book to analyze the algorithm on strings; chapter 3 is on the probabilistic and combinatorial inclusion-exclusion principle, the basic tool of combinatorial analysis; chapter 4 is devoted to the most popular probabilistic tool, that of the first and second moment methods. In chapter 5 the author discusses both the subadditive ergodic theorem and the large deviations, and in chapter 6 he introduces elements of information theory. Chapter 7 introduces generating functions. Chapter 8 (complex asymptotic methods) is the longest in this book. It presents an extensive course on complex asymptotic methods: the Euler-Maclaurin summation formula, matched asymptotics, the WKB method, singularity analysis, the saddle point method, and asymptotics of certain alternating sums. Applications discussed include the minimax redundancy rate for memoryless sources and the limiting distribution of the depth in digital search trees. Chapter 9 presents the Mellin transform and its asymptotic properties. Chapter 10 is devoted to a relatively new asymptotic method known as depoissonization, based on the observation that certain problems are easier to solve when a deterministic input is replaced by a Poisson process. There is a bibliography of 463 items.

Numerical Methods in Finance—A MATLAB-based Introduction. By Paolo Brandimarte, John Wiley and Sons, 2001, xv+403 pp., $89.95

This is a volume in the Wiley Series in Probability and Statistics. This intermediate-level textbook had its origin in lectures on numerical methods for finance, aimed at graduate students in economics, and on optimization aimed at students in industrial engineering. It is structured in three groups of chapters. In part I (Background), chapters 1 and 2 deal with finance and numerical analysis, respectively, the first being aimed at engineering, the second at economics students. In part II (Numerical Methods), chapters 3, 4, and 5 deal with the three main topics of the book: optimization theory, Monte-Carlo simulation, and finite difference methods for partial differential equations. In part III (Applications to Finance), chapters 6–8 give a few illustrative examples of each of the three methodologies covered: optimization models for portfolio management, option valuation by Monte-Carlo simulation, option valuation by finite difference methods. There are two appendices, on MATLAB programming and basic probability theory, respectively.

Analysis on Fractals. By Jun Kigami, Cambridge University Press, 2001, viii+226 pp., $54.95

This is volume 143 in the series Cambridge Tracts in Mathematics. It focuses on the dynamical aspects of fractals, such as heat diffusion on fractals and the vibration of a material with fractal structure. It provides a self-contained introduction to the subject, starting from the basic geometry of self-similar sets (chapter 1) and going on to discuss recent results, including the properties of eigenvalues and eigenfunctions of the Laplacians and the asymptotic behaviours of heat kernels on self-similar sets. In chapter 2 the author studies analysis on finite sets, namely, Dirichlet forms and Laplacians. Those notions are closely related to electrical networks. Chapter 3 is in the heart of the book and explains how to construct Dirichlet forms, harmonic functions, Green's functions, and Laplacians on post critically finite self-similar sets, and chapter 4 studies eigenvalues and eigenfunctions of Laplacians on such sets. The final chapter studies (Dirichlet or Neumann) heat kernels associated with Laplacians (or Dirichlet forms).

Models for Discrete Data. By Daniel Zelterman, Oxford University Press, 1999, x+233 pp., $65.00

This is a volume in the series Oxford Science Publications. Its level is suitable for graduate courses in statistics and biostatistics departments and the examples given have a decidedly health/medical bias. Its emphasis is on logistic regression and log-linear models, but it is different from some other texts in its inclusion and emphasis on topics such as the negative binomial distribution and the many forms of the hypergeometric distribution. It also treats coordinate-free models, which are part of the larger family of generalized linear models, and shows how they are implemented in SAS, the language in which most programs in the book are written (some others are written in S-Plus and FORTRAN). It is noteworthy that throughout the book, the software is integrated into the text. Another major difference from other texts is a detailed treatment of the issues of sample size and power.

Critical Phenomena in Natural Sciences—Chaos, Fractals, Selforganization and Disorder: Concepts and Tools. By D. Sornette, Springer, 2000, xvii+434 pp.

The author's main goal is to present some of the most useful modern theoretical concepts and techniques for understanding and modeling the large variability found in the world, illustrating them with examples from the geosciences. Chapter headings: 1. Useful notions of probability theory; 2. Sums of random variables, random walks and the central limit theorem; 3. Large deviations; 4. Power law distributions; 5. Fractals and multifractals; 6. Rank-ordering statistics and heavy tails; 7. Statistical mechanics: probabilistic point of view and the concept of "temperature"; 8. Long-range correlations; 9. Phase transitions: critical phenomena and first order transitions; 10. Transitions, bifurcations and precursors; 11. The renormalization group; 12. The percolation model; 13. Rupture models; 14. Mechanisms for power laws; 15. Self-organized criticality; 16. Introduction to the physics of random systems; 17. Randomness and long-range Laplacian interactions. There is a bibliography of 832 items.

Intermittency in Turbulent Flows. Edited by J. C. Vassilicos, Cambridge University Press, 2000, xi+276 pp., $74.95

These are the Proceedings of a Workshop held at the Isaac Newton Institute for Mathematical Sciences, Cambridge, in June 1999, the aim of which was to capture and summarize the developments in the last decade in the search to describe and understand the intermittency of turbulent flows and other dynamical systems. There are sixteen papers, which provide an overview of the current understanding of the subject.

Waves in Fluids. By James Lighthill, Cambridge University Press, 2001, xv +504 pp., $31.95

This is a reissue in the Cambridge Mathematical Library series of the late Sir James Lighthill's standard and invaluable treatise, first published in 1978. There are four chapters (1. Sound waves; 2. One-dimensional waves in fluids; 3. Water waves; 4. Internal waves), an epilogue, and a bibliography of well over 200 items, each with perceptive and often quite detailed annotations by the author.

The Seismic Wavefield: Volume I; *Introduction and Theoretical Development.* By B. L. N. Kennett, Cambridge University Press, 2002, x + 370 pp., $100.00 (hardback), $35.95 (paperback)

This work provides a guide to the understanding of seismograms in terms of physical propagation processes within the earth. The focus is on the observation of earthquakes and man-made sources, from the near source region out to thousands of kilometers from the source, both for body and surface waves. Emphasis is on the link between theory and observation, made at a number of levels. Volume I begins with a survey of the structure of the earth and the nature of seismic wave propagation, using examples of observed seismograms. Volume II will cover local and regional seismic events, global wave propagation, and the three-dimensional earth. The emphasis throughout is on waves in seismological applications, and the selection of methods and techniques is designed to provide physical insight. There are 16 chapters, divided—except for an introduction—into two parts: I. Seismic Waves and the Structure of the Earth (chapters 2–6) and II. Seismic Wave Propagation: General (chapters 7–16). Chapter headings: 1. Introduction; 2. Earthquakes and earth structures; 3. Seismic waves; 4. Seismic sources; 5. Seismic phases; 6. Building a seismogram; 7. Stress and strain; 8. Seismic waves I: plane waves; 9. Seismic waves II: wavefronts and rays; 10. Rays in stratification; 11. Seismic sources; 12. Waves in stratification; 13. Reflection and transmission; 14. Building the response of a model; 15. Constructing the wavefield; 16. Body waves and surface waves.

Robust Bayesian Analysis. Edited by David Rios Insua and Fabrizio Ruggeri, Springer-Verlag, 2000, xiii + 422 pp., $59.95

This is volume 152 in the series Lecture Notes in Statistics. It presents an overview of the current state of robust Bayesian methods and their applications. The 21 papers are divided into eight parts. The paper in part I provides an overview of the subject at a non-technical level. The paper in part II concerns foundational aspects and describes decision-theoretical axiomisations. The four chapters in part III (Global and Local Robustness) discuss sensitivity to the prior. Likelihood robustness is the topic of the paper in Part IV, and the three papers in Part V (Loss Distributions) address the issue of loss robustness, focussing on ranges of posterior expected loss, efficient sets and stability of Bayesian decisions. The robust Bayesian approach is compared with other statistical methods in Part VI (three papers), and relevant algorithms are presented in the three papers in Part VII. Part VIII (five papers) presents a discussion of case studies. There is a bibliography of about 400 items.

An Introduction to Probability and Statistics. By Vijay K. Rohatgi and A. K. Md. Ehsanes Saleh, John Wiley and Sons, 2001, xiv + 716 pp.

This is the second edition of a volume in the Wiley Series in Probability and Statistics—Texts and Reference Section. The contents of the text have been greatly updated from the first (1975) edition, with many revisions and additions to bring it up to date.

Generalized Linear Models, with Applications in Engineering and the Sciences. By Raymond H. Myers, Douglas C. Montgomery, and Geoffrey Vining, John Wiley and Sons, 2001, xiii + 342 pp., $89.95

This is a volume in the Wiley Series in Probability and Mathematical Statistics. It fulfills the need for an introductory textbook on the generalized linear model (GLM), for anyone who has completed a course in regression analysis and is familiar with basic model-fitting and statistical inference procedures. Special features of the text are (i) a thorough treatment of logistic and Poisson regression, special but particularly important cases of the GLM; (ii) an introduction to generalized estimating equations (GEE), an important extension of GLMs where correlation structures are assumed within large experimental units where repeated observations are taken; (iii) many examples of the GLM, such as applications in biology and biopharmacology, engineering, quality assurance, and designed experiments; (iv) considerable guidance on computing in SAS PROC GENMOD and S-PLUS. Chapter headings: 1. Introduction to GLMs; 2. Linear regression models; 3. Nonlinear regression models; 4. Logistic and Poisson regression models; 5. The family of GLMs; 6. Generalized estimating equations; 7. Further advances and applications of the GLM. There are six appendices on background material and some computational details.

Annual Review of Genomics and Human Genetics, vol. 2. Edited by Eric Lander, David Page, and Richard Lifton, Annual Reviews, 2001, viii + 532 pp.

In addition to an introductory article, Hundred-Year Search for the Human Genome, by Frank Ruddle, this volume contains 18 papers, on subjects such as: pharmacogenomics, DNA damage processing, human genetics (lessons from Quebec), genetics of Finland, gene therapy, human genetics on the web, single nucleotide polymorphism (SNP) genotyping, antimicrobials and genomics, systems biology, privacy of genetic information, the genetics of aging, and others.

Analysis of Financial Time Series: Financial Econometrics. By Ruey S. Tsay, John Wiley and Sons, 2002, xii + 448 pp., $89.95

This is a volume in the Wiley Series in Probability and Mathematical Statistics. It is an introductory book intended to provide a comprehensive and systematic account of financial econometric models and their application to modeling and prediction of financial time series data, with the aim to teach basic characteristics of financial data and the understanding of the application of financial econometric models, and to give experience in analyzing financial time series. It combines recent developments in financial econometrics in the econometric and in the statistical literature. A feature of the book is the emphasis on real examples and data analysis, real financial data being used throughout. Computer packages used are SCA (Scientific Computer Associates), RATS (Regression Analysis for Time Series), and S-Plus (for implementing neural networks and obtaining postscript plots). Chapter headings: 1. Financial time series and their characteristics; 2. Linear time series analysis and its applications; 3. Conditional heteroscedastic models; 4. Nonlinear models and their applications; 5. High-frequency data analysis and market microstructure; 6. Continuous-time models and their applications; 7. Extreme values, quantile estimation, and value of risk; 8. Multivariate time series analysis and its applications; 9. Multivariate volatility models and their applications; 10. Markov chain Monte-Carlo methods with applications.

Acoustics of Fluid-Structure Interactions. By M. S. Howe, Cambridge University Press, 1998, x + 560 pp., $85.00

This is a volume in the series Cambridge Monographs on Mechanics, which was established by George Batchelor in 1952. It deals with that branch of fluid mechanics concerned with the production and absorption of sound occurring when unsteady flow interacts with solid bodies. Acoustics is here regarded as a branch of fluid mechanics and the necessary background in this subject is provided in the first chapter. Chapter headings: 1. Introduction; 2. Aerodynamic sound in unbounded flows; 3. Sound generation in a fluid with rigid boundaries; 4. Sound generation in a fluid with flexible boundaries; 5. Interaction of sound with solid structures; 6. Resonant and unstable systems. There is a bibliography of 486 items.

Deterministic Observation Theory and Applications. By Jean-Paul Gauthier and Ivan Kupka, Cambridge University Press, 2001, viii + 226 pp., $69.95

This book presents a general theory as well as a constructive methodology to solve "observation problems", that is, reconstructing the full information about a dynamical process on the basis of partially observed data. A general methodology to control processes on the basis of the observations is also developed, and applications in the chemical and petroleum industries are provided. Chapter headings: 1. Introduction; Part I, Observability and Observers: 2. Observability concepts; 3. The case $d_y \leq d_u$; 4. The case $d_y > d_u$; 5. Singular state-output mappings; 6. Observers: the high-gain construction; Part II, Dynamic Output Stabilization and Applications: 7. Dynamic output stabilization; 8. Applications.

Theory of Solidification. By Stephen H. Davis, Cambridge University Press, 2001, xiv + 385 pp.

This is a volume in the series Cambridge Monographs in Mechanics. It is devoted to the study of liquid (melt) to solid transformations of atomically rough materials: metals or semiconductors, including model organics like plastic crystals. The emphasis is on the use of instability behaviour as a means of understanding those processes that ultimately determine the microstructure of a crystalline solid. The fundamental building block of this study is the Mullins-Sekerka instability of a front, which gives conditions for the growth of infinitesimal disturbances of a solid-liquid front. Chapter headings: 1. Introduction; 2. Pure substances; 3. Nonlinear theory for directional solidification; 4. Anisotropy; 5. Disequilibrium; 6. Dendrites; 7. Eutectics; 8. Microscale fluid flow; 9. Mesoscale fluid flow; 10. Phase-field models.

Self-Organizing Map Formation: Foundations of Neural Computation. Edited by Klaus Obermayer and Terrence J. Sejnowski, MIT Press, 2001, xvii + 440 pp., $34.95

This is a volume in the series Computational Neuroscience. It consists of 22 papers, arranged in five groups, which have appeared in the journal *Neural Computation* over the past ten years. The groups are entitled: 1. Receptive fields; 2. Models of topographic maps in the brain; 3. Models of cortical feature maps; 4. Self-organizing maps for unsupervised data analysis; 5. Extensions of self-organizing maps.