Quarterly of Applied Mathematics

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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 I 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,

\[ \exp[(a^2 + b^2)^{1/2}] \]

is preferable to \( e^{a^2 + b^2} \). 

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

\[ \frac{\cos(x/2b)}{\cos(a/2b)} \]

is preferable to \( \frac{\cos x}{\cos a} \). 

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

\[ \int u^{-1} \sin u \, du \]

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 \]

is preferable to \( \cos (a + bx) \).

Figures: Figures should be drawn in black ink with clean, unbroken lines; do not use ball point pen. The paper should be of a nonabsorbtant 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 süber 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.
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This is a volume in the Wiley Series in Probability and Statistics—Texts and References Section. It is the third edition of a book originally published by Wiley in 1966 under the title Measurement and Analysis of Random Data. The primary purpose of the book remains the same, namely, to provide a practical reference for working engineers and scientists in many fields. It has also been used as a teaching text for advanced courses on the analysis of random processes. Chapter headings: 1. Basic descriptions and properties; 2. Linear physical systems; 3. Probability fundamentals; 4. Statistical principles; 5. Stationary random processes; 6. Single-input/output relationships; 7. Multiple input/output relationships; 8. Statistical errors in basic estimates; 9. Statistical errors in advanced estimates; 10. Data acquisition and processing; 11. Data analysis; 12. Nonstationary data analysis; 13. The Hilbert transform. Chapter 10 has been completely rewritten to cover major changes since the publication of the 2nd edition. Chapter 11 has been updated to include new approaches to spectral analysis, made practical by the increased capacity and speed of digital computers. Chapter 12 has been expanded to cover recent advances.

Foundations of Logic and Mathematics—Applications to Computer Science and Cryptography. By Yves Nievergelt, Birkhäuser, 2001, xvi + 415 pp., $59.95

Questions the author attempts to answer in this book are, in his words: Why is the truth table for the logical implication so unintuitive? Why are there no recipes to design proofs? Where do these numerous mathematical rules come from? What are the applications of formal logic and abstract mathematics? What issues in logic, mathematics and computer science still remain unresolved? There are seven chapters, grouped under the headings of theory (0–4) and applications (5–7), as follows: 0. Boolean algebraic logic; 1. Logic and deductive reasoning; 2. Set theory; 3. Induction, recursion, arithmetic, cardinality; 4. Decidability and completeness; 5. Number theory and codes; 6. Ciphers, combinatorics, and probability; 7. Graph theory. There is a bibliography of 109 items.


This is a volume in the series Cambridge Monographs on Mathematical Physics. It is the first pedagogical introduction to the harmonic superspace method in extended (N > 1) supersymmetry, providing a systematic treatment of the quantum field theories with N = 2 and N = 3 extended supersymmetries in harmonic superspace. The authors present the harmonic superspace approach as a means of providing a concise and covariant off-shell description of all the N = 2 supersymmetric theories, at both the classical and the quantum levels. The book will be of interest to researchers and graduate students working in the areas of supersymmetric field theory, string theory, and complex geometries. Chapter headings: 1. Introductory overview; 2. Elements of supersymmetry; 3. Superspace; 4. Harmonic analysis; 5. N = 2 matter with infinite sets of auxiliary fields; 6. N = 2 matter multiplets with a finite number of auxiliary fields. N = 2 duality transformations; 7. Supersymmetric Yang-Mills theories; 8. Harmonic supergraphs; 9. Conformal invariance in N = 2 harmonic superspace; 10. Supergravity; 11. Hyper-Kähler geometry in harmonic space; 12. N = 3 supersymmetric Yang-Mills theory; 13. Conclusions.
Statistical Modeling, Analysis and Management of Fuzzy Data. Edited by Carlo Bertoluzza, Maria A. Gil, and Dan A. Ralescu, Physica-Verlag, 2002, xiv + 309 pp., $84.00

This is volume 87 in the series Studies in Fuzziness and Soft Computing. It is its aim to contribute to a better understanding of the question whether fuzziness and randomness are distinct or coexistent facets of uncertainty and whether their theories are competitive or complementary. The eighteen papers in this volume are divided into four parts: 1. Fuzziness and randomness (1 paper); 2. Fuzzy-valued random elements (6 papers); 3. Possibility, probability and fuzzy measures (5 papers); 4. Statistics and fuzzy data analysis (6 papers).


This is the second edition of a volume in the Wiley Series in Probability and Statistics. It deals with the exploration and optimization of response surfaces. Response surface design integrates the three topics of experimental design, regression modeling techniques and optimization methods into a single methodology. The book assumes some previous exposure to statistical methods and matrix algebra. This second edition is a major revision of the book, new material, ideas and examples having been incorporated. Also, the computer has been more tightly woven into the presentation, relying on Design-Expert Version 6 for much of the computing, but also continuing to employ SAS and Minitab for some applications. Chapter headings: 1. Introduction; 2. Building empirical models; 3. Two-level factorial designs; 4. Two-level fractional factorial designs; 5. Process improvement with steepest ascent; 6. The analysis of second order response surfaces; 7. and 8. Experimental designs for fitting response surfaces I and II; 9. and 10. Advanced response surface topics I. and II; 11. Robust parameter design and process robustness studies; 12. Experiments with mixtures; 13. Other mixture design and analysis techniques; 14. Continuous process improvement with evolutionary operation. There are 10 appendices on background and details.
**Experiments with Mixtures: Designs, Models, and the Analysis of Mixed Data.** By John Cornell, John Wiley and Sons, 2002, xix + 649 pp., $115.00

This is the third edition of a volume in the Wiley Series in Probability and Statistics and first published in 1981 (second edition: 1990). Most of the additions in this edition have been to chapters 5 through 9, with most attention having been given to chapter 8. An updated bibliography contains more than 200 listings. Chapter headings: 1. Introduction; 2. The original mixture problem: designs and models for exploring the entire simplex factor space; 3. The use of independent variables; 4. Multiple constraints on the component proportions; 5. The analysis of mixture data; 6. Other mixture model forms; 7. The inclusion of process variables in mixture experiments; 8. Additional topics; 9. Matrix algebra, least squares, and the analysis of variance; 10. Data sets from mixture experiments with partial solutions.


This is a volume in the Wiley Series in Probability and Statistics. It presents statistical rules of thumb for practitioners of statistical science. Its intent is to stimulate thinking about designing and conducting a study, analyzing its data, and communicating its results. It is accessible to those who have had a basic course in statistics. The book begins with basic statistical considerations about inference, assumptions and statistical processes. The next two chapters deal with sample size and covariation. Chapters 4 and 5 deal with epidemiology and environmental studies, subjects of particular interest to the author. Chapter 6 deals with the design, conduct and analysis of studies and chapter 7 with the presentation of data in terms of words, tables and graphs. Chapter 8 discusses statistical consulting.

**Temporal GIS: Advanced Functions for Field-Based Applications.** By G. Christakos, P. Bogaert, and M. Serre, Springer-Verlag, 2002, xii + 217 pp., $59.95

The main goal of this book is the development of advanced functions for field-based Temporal Geographic Information Systems (TGIS). These fields describe a variety of natural, epidemiological, economic and social phenomena distributed across space and time. Within such a framework, the book makes an attempt to establish links between (a) the currently conceived TGIS techniques, and (b) the Bayesian maximum entropy (BME) techniques of modern spatiotemporal geostatistics. The eight chapters are organized around four themes: concepts, mathematical tools, computer programs, and applications. Chapter headings: 1. A BME view to the new realities of TGIS; 2. Spatiotemporal modeling; 3. Knowledge based integration; 4. Spatiotemporal mapping; 5. Interpretive BME; 6. The BME toolbox in action; 7. The BME computer library; 8. Scientific hypothesis testing, explanation, and decision making.

This text introduces the basic mathematical and computational methods of theoretical neuroscience and presents applications in a variety of areas including vision, sensory-motor integration, development, learning, and memory. It is divided into three parts. Part I (chapters 1–4) discusses the relationship between sensory stimuli and neural responses, focusing on the representation of information by the spiking activity of neurons. Part II (chapters 5–7) discusses the modeling of neurons and neural circuits on the basis of cellular and synaptic biophysics. Part III (chapters 8–10) analyzes the role of plasticity in development and learning. An appendix covers the mathematical methods used, and exercises are available on the book’s web site. Chapter headings: 1. Neural encoding I: firing rates and spike statistics; 2. Neural encoding II: reverse correlation and visual receptive fields; 3. Neural decoding; 4. Information theory; 5. Model neurons I: neuroelectronics; 6. Model neurons II: conductances and morphology; 7. Network models; 8. Plasticity and learning; 9. Classical conditioning and reinforcement learning; 10. Representational learning.


This is volume 147 in the series Cambridge Tracts in Mathematics. The concept of a Floer homology, a recent development in differential geometry, yields rigorously defined invariants which can be viewed as homology groups of infinite-dimensional cycles. The first half of the book gives a thorough account of Floer’s construction in the context of gauge theory over 3- and 4-dimensional manifolds. The second half works out some further technical developments of the theory, and the final chapter outlines some research developments for the future, including a discussion of the appearance of modular forms in the theory.


Accretion Power in Astrophysics. By Julian Frank, Andrew King, and Derek Raine, Cambridge University Press, 2002, xiv + 384 pp., $110.00 (hardback), $40.00 (paperback)

This is the third edition of a book first published in 1985. Its subject is astrophysical accretion, especially in those circumstances where accretion is believed to make an important contribution to the total light in an astrophysical system; since the first edition, the subject has become a still more central theme of modern astrophysics. The extraction of gravitational potential energy from material which accretes on to a gravitating body is now known to be the principal source of power in several types of close binary systems, and is widely believed to provide the power supply in active galactic nuclei and quasars. The book examines accretion as a source of energy in both binary star systems containing compact objects, and active galactic nuclei. The authors describe the physical processes at work in accretion discs and other accretion flows. The first three chapters explain why accretion is a source of energy, and present the gas dynamics and plasma concepts necessary for astrophysical applications. The next three chapters develop accretion in stellar systems. Further chapters give extensive treatment of accretion in active galactic nuclei and discuss recently discovered accretion flow solutions.

Gaussian Self-Affinity and Fractals – Globality, The Earth, 1/f Noise, and R/S. By Benoit B. Mandelbrot, Springer-Verlag, 2002, ix + 654 pp., $54.95

The first third of this volume H in Mandelbrot’s Selecta consists of extensive introductory material written especially for it. It incorporates an overview of fractals and multifractals, an introduction to cartoon fractal and multifractal functions, numerous pedagogical innovations, and a number of new observations and mathematical conjectures. The remainder of the volume consists of reprints of the author’s classical papers that center on a detailed study of fractional Brownian functions. Additional themes are R/S statistical analysis, the multiplicity of distinct fractal dimensions under self-affinity, and 1/f noise. Many chapters begin with newly written Forewords.


This is volume 17 in the series Cambridge Studies in Mathematical Biology. It presents a description of several ways in which mathematics and statistics are being used in genome analysis and sequencing. Chapter headings: 1. Decomposing DNA; 2. Recomposing DNA; 3. Sequence statistics; 4. Sequence comparison; 5. Spatial structure and dynamics of DNA.


This is a volume in the series Oxford Classic Texts in the Physical Sciences and is a reprint of the third, 1961, edition of the treatise first published in 1939, when it was years ahead of its time. It was the first text to develop a fundamental theory of inference based on the ideas of Bayesian statistics, ideas which have by now been generally accepted, as well as significantly developed and extended.

The development of kernel-based learning methods has resulted from a combination of machine learning theory, optimization algorithms from operations research, and kernel techniques from mathematical analysis. This book represents a comprehensive and accessible account of these developments. It includes all the mathematical and algorithmic background needed to master the material. There are eighteen chapters and a tutorial introduction, in three parts: Part I (chapters 2-6): Concepts and Tools; Part II (chapters 7-12): Support Vector Machines; Part III (chapters 13-18): Kernel Methods.


This is the second edition of a text first published in 1992. In addition to several new sections, many new exercises and their solutions have been added. The text aims to present in an accessible yet rigorous way the core mathematics requirement for undergraduate computer science students at British universities. The theory is placed in context by including a selection of the more salient applications. Chapter headings: 1. Logic; 2. Mathematical proof; 3. Sets; 4. Relations; 5. Functions; 6. Matrix algebra; 7. Systems of linear equations; 8. Algebraic structures; 9. Boolean algebra; 10. Graph theory; 11. Applications of graph theory.

Lévy Statistics and Laser Cooling – How Rare Events Bring Atoms to Rest. By François Bardou, Jean-Philippe Bouchaud, Alain Aspect, and Claude Cohen-Tannoudji, Cambridge University Press, 2002, xii + 199 pp., $90.00 (hardback), $30.00 (paperback)

The authors present laser cooling of atoms as a case study for the application of Lévy statistics in a situation where statistical models can be derived from first principles. The book demonstrates how the most efficient laser cooling techniques can be simply and quantitatively understood in terms of non-ergodic random processes dominated by a few rare events. Lévy statistics is the proper framework for analysing problems in many different fields (physics, biology, earth sciences, finance, etc.) for which Gaussian statistics is inadequate; it involves random variables with such heavy-tailed distributions that the usual C.L.T. no longer holds. In laser cooling, atoms are cooled to very low temperatures and brought to rest—it is a new field with many applications. Chapter headings: 1. Introduction; 2. Subrecoil laser cooling and anomalous random walks; 3. Trapping and recycling. Statistical properties; 4. Broad distributions and Lévy statistics: a brief overview; 5. The proportion of atoms trapped in quasi-dark states; 6. The momentum distribution; 7. Physical discussion; 8. Tests of the statistical approach; 9. Example of application: optimization of the peak of cooled atoms; 10. Conclusion. Appendix A: Correspondence between parameters of the statistical models and atomic and laser parameters; Appendix B: The Doppler case.