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ANNUAL INDEX

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 which 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 Stromung zaher 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

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0033-569X(199412)52:4;1-S

State Space Modeling of Time Series, Second, revised and enlarged edition. By Masanao Aoki. Springer-Verlag, 1990. xvii+323 pages, $29.50.

One of the additions in this new edition is a description of the asymptotic properties of the estimators proposed in the first edition, and those of the instrumental-variable estimators, newly introduced in this edition, which use the state vectors as the vectors of instruments. The chapters devoted to preparatory material have also been completely reorganised. The author believes that modeling of (economic) time series can benefit from recent advances in system theory, and that, indeed, model building is the essence of time series analysis. Thus, one major objective of this book is to describe and evaluate several model construction methods, yielding Markovian or state space models of time series. A second objective is to assess computational, structural and other properties of models thus constructed and to compare them with those of more traditional models. The book falls naturally into four parts: Part I, preparatory to Part II (Chapters 1–3); Part II, the main body (Chapters 5–10); Part III (Chapter 11); Part IV (Chapter 12 and appendices). Chapter headings: 1. Introduction; 2. The notion of state; 3. Data generating process; 4. State space and ARMA models; 5. Properties of state space models; 6. Hankel matrix and singular value decomposition; 7. Innovation models, Riccati equations, and multiplier analysis; 8. State vectors and optimality measures; 9. Estimation of system matrices; 10. Approximate models and error analysis; 11. Integrated time series; 12. Numerical examples. Appendices.

Reaction-Diffusion Equations. Edited by K. J. Brown and A. A. Lacey. Oxford University Press, 1990. x+224 pages, $65.00.

These are the Proceedings of a Symposium Year on Reaction-Diffusion Equations organized by the Department of Mathematics, Heriot-Watt University, 1987–1988. They survey recent developments over the whole area of the subject. The contributions indicate both the wide range of situations in which reaction-diffusion equations can arise, for example, biology (nerve propagation), electrochemistry, combustion (ignition), and ecology as well as the wide range of mathematical techniques which are being brought to bear on such problems, e.g., classical partial differential equation techniques such as comparison principles, nonlinear functional analysis, and topological index theory.

Discrete Dynamical Systems: Theory and Applications. By James T. Sandefur. Oxford University Press, 1990. xiii+445 pages.

This text expounds the study of quantities that change at discrete points in time, such as the size of a population from one year to the next, or the change in the genetic make-up of a population from one generation to the next. In general, it concurrently develops a model of some situation and the mathematical theory necessary to analyze that model. Chapter headings: 1. Introduction to dynamical systems; 2. First order linear dynamical systems; 3. Introduction to nonlinear dynamical systems; 4. Complex behavior for nonlinear dynamical systems; 5. Higher order linear dynamical systems; 6. Dynamical systems of several equations; 7. Nonlinear systems of several equations.

Nonlinear Evolution Equations That Change Type. Edited by Barbara Lee Keyfitz and Michael Shearer. Springer-Verlag, 1990. xiv+284 pages, $35.00.

This is volume 27 of the IMA Volumes in Mathematics and Its Applications. It is based on the proceedings of a workshop which was an integral part of the 1988–89 IMA program on Nonlinear Waves. The workshop focused on problems of ill-posedness and change of type which arise in modeling flows in porous materials, viscoelastic fluids and solids and phase changes. There are 19 papers in the volume.

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Nonlinear Ordinary Differential Equations and Their Applications. By P. L. Sachdev. Marcel Dekker, Inc., 1991. xviii+578 pp., $110.00 ($45.00 on orders of five or more copies for classroom use).

This is volume 142 in *Pure and Applied Mathematics—A Series of Monographs and Textbooks.* The author presents in this text a variety of methods that help treat nonlinear ODEs either exactly or by some approximate means that highlight their structure and facilitate their understanding. There is a profusion of examples drawn from the research literature on applications of differential equations. The final chapter is devoted to the solution of systems of nonlinear PDEs with appropriate initial/boundary conditions, describing time-dependent fluid dynamic problems. There are nine chapters: 1. Review of linear ODEs; 2. Transformations of nonlinear ODEs; 3. Series solutions of nonlinear DEs; 4. Local and global analysis of nonlinear DEs; 5. Existence theory for boundary value problems via shooting techniques; 6. Phase space study of autonomous systems; 7. Singularity structure and chaotic behavior of nonlinear ODEs; 8. Painlevé transcendents; 9. Applications of the theory of nonlinear ODEs to solutions of PDEs—some physical problems.

Orthogonal Schauder Bases. By Taqdir Husain. Marcel Dekker, Inc., 1991. xvii+283 pp., $99.75 ($45.00 on orders of five or more copies for classroom use).

This is volume 143 in *Pure and Applied Mathematics—A Series of Monographs and Textbooks.* The purpose of this monograph is to present a cohesive and cumulative account of the research done on the subject of Schauder bases during the last several years, including some new material.

Minimax Solutions in Sampling from Finite Populations. By Siegfried Gabler. Springer-Verlag, 1990. 132 pp., $19.00.

This is volume 64 in the series *Lecture Notes in Statistics.* It discusses the minimax principle as an alternative to the maximum likelihood principle and the minimum variance unbiased estimation method for finding estimators in several different spaces, as indicated by the table of contents: 1. Decision theoretic foundations in survey sampling; 2. Minimax solutions in permutation invariant parameter spaces; 3. The cuboid as parameter space; 4. The GHH-space as parameter space; 5. The generalized HH-space as parameter space.

Tools for Statistical Inference: Observed Data and Data Augmentation Methods. By Martin A. Tanner. Springer-Verlag, 1991. 110 pp., $20.00.

This is volume 67 in the series *Lecture Notes in Statistics.* It contains material presented in a course given during the 1990 spring semester at the University of Wisconsin, Madison. The author first considers four examples as motivation: censored regression data (hard core missing data, from the Stanford Heart Transplant Program), randomized response data (missing data by design), latent class analysis (soft core missing data, from the 1972/3/4 General Social Survey), hierarchical models (no missing data). The author discusses several methods for the Bayesian or likelihood-based analysis of the above data sets and distinguishes in his discussion between *observed data* and *data augmentation* methods. He devotes a chapter to the EM algorithm, as the simplest approach using data augmentation, and in a final chapter describes the Gibbs Sampler, a multivariate extension of *chained data augmentation.*

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Modeling Techniques and Tools for Computer Performance Evaluation. Edited by Ramon Puigjaner and Dominique Potier. Plenum Publishing Company, 1989. xiv+452 pp., $95.00.

These are the Proceedings of the Fourth International Conference on Modeling Techniques and Tools for Computer Performance Evaluation, held September 14–16, 1988, in Palma, Balearic Islands, Spain. The 28 papers are divided into the following groups: Modeling tools; Architecture and workload; Protocols; Parallelism; Algorithms.

The Principles of Electromagnetic Theory. By Attay Kovetz. Cambridge University Press, 1990. xv+221 pp., $49.50 (cloth), $19.95 (paper).

This text is the outcome of a course attended by physics undergraduates during the second semester of their sophomore year, by which time they have been exposed to electromagnetism and special relativity. Chapter headings: 1. Electric charges and currents; 2. The electromagnetic field and the aether relations; 3. Polarization and magnetization; 4. The fusion of electromagnetism with mechanics and thermodynamics; 5. Electromagnetic materials; 6. Electrostatics; 7. Dielectrics; 8. Magnetism; 9. Conductors; 10. Radiation; 11. Electromagnetic wave propagation.

A Development of the Equations of Electromagnetism in Material Continua. By Harry F. Tiersten. Springer-Verlag, 1990. xi+156 pp., $49.00.

This is volume 36 in the series *Springer Tracts in Natural Philosophy.* It is based on a course of lectures intended to provide graduate students in mechanics with an understanding of electromagnetism and prepare them for studies on the interaction of the electric and magnetic fields with deformable solid continua. There are three parts: I. Electrostatics (chapters 2–5), II. Magnetostatics (chapters 6–9), III. Electromagnetics (chapters 10–14). The chapter headings are: 1. Introduction; 2. Electric field equations in charged regions; 3. Electric field equations in charged and polarized regions; 4. Forces and torques exerted by the electric field; 5. Electrostatic energy; 6. Magnetic field equations in regions; 7. Magnetic field equations in magnetized regions carrying steady currents; 8. Forces and torques exerted by the magnetic induction field on magnetized matter carrying current; 9. Magnetostatic energy; 10. The e.m. field equations; 11. Energy and momentum in the e.m. field; 12. The influence of motion on the e.m. field equations; 13. The e.m. potentials; 14. Linear circuit equations from Maxwell's equations.

Rabdology. By John Napier, translated by William Frank Richardson, introduction by Robin E. Rider. The MIT Press, 1991. xxxvi+134 pp., $40.00.

This is volume 15 in the Charles Babbage Institute Reprint Series for the History of Computing. In this volume, published in Edinburgh in 1617, the year of his death, John Napier, the inventor of logarithms, offered several instrumental aids to calculating. The first of its four parts describes and illustrates the sets of rods (known as "Napier's rods" or, when made of ivory, "Napier's bones") from which the title of the whole work is derived. The four parts are entitled: I. The use of rods in general; II. The use of rods in geometry and mechanics with the help of tables; III. Appendix: The high-speed promptuary for multiplication; IV. Location arithmetic as performed on a chessboard.

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Vector Models for Data-Parallel Computing. By Guy E. Blelloch. The MIT Press, 1990. xiv+255 pp., $37.50.

This is a revised version of the author's doctoral dissertation, whose main purpose is to explore the power of data-parallel programming. It is divided into four parts: 1. Models, which formally defines a class of strictly data-parallel models; 2. Algorithms, which shows how data structures can be represented with vectors and describes algorithms for a variety of problems, including sorting, linear programming, finding the minimum-spanning tree of a graph and the closest pair in a plane; 3. Languages, which describes how a class of very-high-level languages can be mapped onto the parallel-vector models; 4. Architectures, which describes the implementation of parallel-vector models on the Connection Machine.

Annual Review of Fluid Mechanics, Volume 23. Edited by John L. Lumley, Milton Van Dyke, and Helen L. Reed. Annual Reviews, Inc., 1991. viii+674 pp., $40.00.

This volume contains 18 review articles, on subjects such as environmental fluid mechanics, ocean studies, drag reduction, hydraulics, closure problems in turbulence, exact Navier-Stokes solutions, hurricane theory, vapor deposition on thin films, gas-liquid flow in contactors, particle-imaging, fluid-rock systems, bifurcations in fluid dynamics, waves and currents over the continental shelf, formulation issues in incompressible fluid dynamics, turbulent mixing, wall-bounded shear flow, fractals in turbulence, coherent motions in the turbulent boundary layer.

Decentralized Control of Complex Systems. By Dragoslav D. Siljak. Academic Press, 1990. xiv+527 pp., $74.95.

This is volume 184 in the series *Mathematics in Science and Engineering.* Its plan is as follows. Chapter 1 provides a graph-theoretic framework for structural modelling of complex systems. Chapter 2 presents results concerning robust stabilization *via* decentralized feedback. Optimization is the subject of chapter 3, where robustness is emphasized. Output feedback is considered in the context of interconnected observers (chapter 4) and directly using controllers (chapter 5). Manipulative power of graphs is exploited in chapter 6 (hierarchical LBT decompositions) and in chapter 7 (nested epsilon decompositions). Overlapping decompositions and the underlying inclusion principle are presented in chapter 8 and reliability design in chapter 9. At the end of each chapter, comments are provided and relevant literature cited to describe evolution of ideas and to broaden results. Several graph-theoretic algorithms are provided in an appendix.

Epidemics of Plant Diseases: Mathematical Analysis and Modeling. Edited by Jürgen Kranz. Springer-Verlag, 1990. xiii+268 pp., $98.00.

This is the second, completely revised edition of volume 13 in the series *Ecological Studies—Analysis and Synthesis.* The first edition was published in 1974, emerging from a symposium presenting the status, and perspectives, of mathematical analysis and modeling in epidemiology as a quantitative science, then ten years old. Due to the increased use of a greater variety and more advanced methods with a wider application, this second edition is virtually a new book, only chapter 5 remaining unchanged. The chapter subjects now are: Epidemics, their mathematical analysis and modeling: an introduction (J. Kranz); 2. Mathematics and statistics for analysis in epidemiology (B. Hau and J. Kranz); 3. Spatial aspects of plant disease epidemics (M. J. Jeger); 4. Soilborne pathogens (C. A. Gilligan); 5. Multiple regression analysis (D. J. Butt and D. J. Royle); 6. Nonlinear disease progress curves (L. V. Madden and C. L. Campbell); 7. Assembling and using models of epidemics (P. E. Waggoner).

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Combinatorial Algorithms for Integrated Circuit Layout. By Thomas Lengauer. John Wiley & Sons, 1990. xxviii+697 pp., $59.95.

This is a volume in *Applicable Theory in Computer Science—A Wiley-Teubner Series in Computer Science.* It is its purpose to give an overview of what are currently the most important combinatorial problems in circuit layout, and to describe their solutions. Algorithms in present use as well as new developments existing only as theoretical proposals are discussed. Part I (chapters 1–4) of the book is a detailed 200-page introductory section providing the foundations for the discussion of layout problems investigated in Part II (chapters 5–10). Chapter headings: 1. Introduction to circuit layout; 2. Optimization problems; 3. Graph algorithms; 4. Operations research and statistics; 5. The layout problem; 6. Circuit partitioning; 7. Placement, assignment, and floorplanning; 8. Global routing and area routing; 9. Detailed routing; 10. Compaction. There is an extensive bibliography, of 484 items.

Selected Papers of S. Chandrasekhar, Volume 6 : The Mathematical Theory of Black Holes and of Colliding Plane Waves. Foreword by Basilis C. Xanthopoulos. University of Chicago Press, 1991. xx+739 pp., $35.00 (paper), $79.95 (cloth).

This is the final volume of the Selected Papers. The 37 papers are grouped into seven sections: The Schwarzschild black hole (3 papers), the Kerr black hole (10 papers), the Reissner-Nordström black hole (5 papers), the mathematical theory of colliding waves (10 papers), cylindrical waves (2 papers), the two-center problem (3 papers), additional papers (4 papers).

Point Processes and Their Statistical Inference. Second Edition, Revised and Expanded. By Alan F. Karr. Marcel Dekker, Inc., 1991. xiv+490 pp., $110.00 ($55.00 on orders of five or more for classroom use).

This is volume 7 in the series *Probability: Pure and Applied, A Series of Textbooks and Reference Books.* The main changes are a complete reorganization and rewriting of material pertaining to the multiplicative intensity model and stationary point processes, additional material concerning the Cox regression model, and an expanded, updated bibliography. Also, expanded explanations of many fundamental statistical concepts have been provided. The table of contents remains the same: 1. Point processes: distribution theory; 2. Point processes: intensity theory; 3. Inference for point processes: an introduction; 4. Empirical inference for point processes; 5. Martingale inference for point processes: general theory; 6. Inference for Poisson processes on general spaces; 7. Inference for Cox processes on general spaces; 8. Nonparametric inference for renewal processes; 9. Inference for stationary point processes; 10. Inference for stochastic processes based on Poisson process samples.

Computer Aided Proofs in Analysis. Edited by Kenneth R. Meyer and Dieter S. Schmidt. Springer-Verlag, 1991. xiii+251 pp., $32.00.

This is volume 28 in the series *The IMA Volumes in Mathematics and Its Applications.* It is based on the proceedings of an IMA Participating Institutions Conference held at the University of Cincinnati in April 1989. It brought together researchers in symbolic algebra and in interval arithmetic with mathematical physicists, functional analysts, celestial mechanists, and others, who were interested in obtaining precise answers to questions in analysis by computer methods. The 21 papers in the volume reflect the heterogeneous background of the participants.

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The Art of Modeling Dynamic Systems: Forecasting, for Chaos, Randomness, and Determinism. By Foster Morrison. John Wiley & Sons, 1991, xvii+387 pp., $49.95.

The style of presentation of this book is a discussion with examples and analogies and avoids the definition-theorem-proof format. The emphasis is on exposition, the goal being to describe the various modeling tools available and indicate what they can, and cannot, do. A unifying concept is introduced in the author's hierarchy of dynamical systems, in which there are 4 types: (i) systems solvable in closed form, (ii) systems solvable by perturbation techniques, (iii) systems with chaotic solutions; and (iv) random systems. There are twenty chapters, divided into five groups: I. Introductory section (2 chapters); II. A thumbnail sketch of applied mathematics (5 chapters); III. Classical models and dynamical concepts (4 chapters); IV. The hierarchy of dynamical systems (6 chapters); V. The art of model making (3 chapters).

Gödel's Theorem in Focus. Edited by S. G. Shanker. Routledge, 1991. ix+261 pp., $14.95.

This is a volume in the series *Philosophers in Focus.* It contains reprints of articles on Gödel's work by John W. Dawson, Jr., Stephen C. Kleene, Solomon Feferman, Michael Resnik, and Michael Detlefsen, as well as Gödel's 1931 paper and a 100-page contribution by the editor, entitled "Wittgenstein's remarks on the significance of Gödel's theorem".

Abstract Analytic Number Theory. By John Knopfmacher. Dover Publications, 1990. 325 pages, $9.95.

This is a corrected and enlarged republication of the work originally published by North-Holland Publishing Company in 1975 as volume 12 in the North-Holland Mathematical Library. Topics treated include arithmetical semigroups, arithmetical functions, semigroups satisfying axiom A, the abstract prime number theorem, Fourier analysis of arithmetic functions. The extensive bibliography has been greatly enlarged for this edition.

Statistical Inference in Stochastic Processes. Edited by N. U. Prabhu and I. V. Basawa. Marcel Dekker, Inc., 1991. viii+276 pp., $89.75 ($45.00 on orders of five or more copies for classroom use).

This is volume 6 in the series *Probability: Pure and Applied, A Series of Textbooks and Reference Books.* The editor is inviting research workers in the field to submit survey or research papers to a series of occasional volumes, of which this is the first and contains eleven papers. Time series analysis, econometrics, as well as inference on Markov processes, point processes, martingales, and spatial processes, are presently active subfields of the general area of statistical inference on stochastic processes.

Representing and Reasoning with Probabilistic Knowledge—A Logical Approach to Probabilities. By Fahiem Bacchus. The MIT Press, 1991, 233 pp., $29.95.

This book is a study of how probabilities can be applied to Artificial Intelligence, examining, in particular, the application of probabilities in the formal design and specification of intelligent systems in general. Chapter headings: 1. Introduction; 2. Propositional probabilities; 3. Statistical probabilities; 4. Combining statistical and propositional probabilities; 5. Default inferences from statistical knowledge.