

evolutionary operation a statistical method for process improvement wiley series in probability and statistics applied probability and statistics section

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Discover 'Evolutionary Operation,' a powerful statistical method designed for significant process improvement. This crucial topic is featured within the esteemed Wiley Series in Probability and Statistics, specifically highlighting its applications in the Applied Probability and Statistics section.

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Evolutionary Operation

This book is about the philosophy and practice of Evolutionary Operation (called EVOP for short), a simple but powerful statistical tool with wide application in industry. Experience has long shown that statistical methods, sometimes quite sophisticated in character, can be of great value in improving the efficiency of laboratory and pilot-plant investigations made by specially trained chemists and engineers. What originally motivated the introduction of EVOP, however, was the idea that the widespread and daily use of simple statistical design and analysis during routine production by process operatives themselves could reap enormous additional rewards.

Evolutionary Operation

Of related interest. Nonlinear Regression Analysis and its Applications Douglas M. Bates and Donald G. Watts ".an extraordinary presentation of concepts and methods concerning the use and analysis of nonlinear regression models.highly recommend[ed].for anyone needing to use and/or understand issues concerning the analysis of nonlinear regression models." --Technometrics This book provides a balance between theory and practice supported by extensive displays of instructive geometrical constructs. Numerous in-depth case studies illustrate the use of nonlinear regression analysis--with all data sets real. Topics include: multi-response parameter estimation; models defined by systems of differential equations; and improved methods for presenting inferential results of nonlinear analysis. 1988 (0-471-81643-4) 365 pp. Nonlinear Regression G. A. F. Seber and C. J. Wild "[a] comprehensive and scholarly work.impressively thorough with attention given to every aspect of the modeling process." --Short Book Reviews of the International Statistical Institute In this introduction to nonlinear modeling,

the authors examine a wide range of estimation techniques including least squares, quasi-likelihood, and Bayesian methods, and discuss some of the problems associated with estimation. The book presents new and important material relating to the concept of curvature and its growing role in statistical inference. It also covers three useful classes of models --growth, compartmental, and multiphase --and emphasizes the limitations involved in fitting these models. Packed with examples and graphs, it offers statisticians, statistical consultants, and statistically oriented research scientists up-to-date access to their fields. 1989 (0-471-61760-1) 768 pp. Mathematical Programming in Statistics T. S. Arthanari and Yadolah Dodge "The authors have achieved their stated intention.in an outstanding and useful manner for both students and researchers.Contains a superb synthesis of references linked to the special topics and formulations by a succinct set of bibliographical notes.Should be in the hands of all system analysts and computer system architects." --Computing Reviews This unique book brings together most of the available results on applications of mathematical programming in statistics, and also develops the necessary statistical and programming theory and methods. 1981 (0-471-08073-X) 413 pp.

Alternative Methods of Regression

Illustrative examples from recent research publications and "classic" studies are prominently featured throughout the book. Research techniques are highlighted in "special interest" boxes. Illustrations and descriptions of research techniques are provided with examples such as fire-scars from trees used to reconstruct disturbance, fossil pollen used to reconstruct vegetation change and plant migration, transect and quadrat sampling. Includes key biogeographical theories that link space and time to the distribution of life. Some of these theories include: 1. Ranges, Reflects, Refuges, Corridors, Barriers, 2. Centers of Origins, 3. Cladistics, 4. Variance, 5. Island BioGeography, 6. Diversity Theory, 7. Gap Analysis for Conservation.

Biogeography

The Wiley Series in Probability and Statistics is a collection of topics of current research interests in both pure and applied statistics and probability developments in the field and classical methods. This series provides essential and invaluable reading for all statisticians, whether in academia, industry, government, or research.

Multiple Time Series

This fully updated and revised third edition, presents a wide ranging, balanced account of the fundamental issues across the full spectrum of inference and decision-making. Much has happened in this field since the second edition was published: for example, Bayesian inferential procedures have not only gained acceptance but are often the preferred methodology. This book will be welcomed by both the student and practising statistician wishing to study at a fairly elementary level, the basic conceptual and interpretative distinctions between the different approaches, how they interrelate, what assumptions they are based on, and the practical implications of such distinctions. As in earlier editions, the material is set in a historical context to more powerfully illustrate the ideas and concepts. Includes fully updated and revised material from the successful second edition Recent changes in emphasis, principle and methodology are carefully explained and evaluated Discusses all recent major developments Particular attention is given to the nature and importance of basic concepts (probability, utility, likelihood etc) Includes extensive references and bibliography Written by a well-known and respected author, the essence of this successful book remains unchanged providing the reader with a thorough explanation of the many approaches to inference and decision making.

Comparative Statistical Inference

The subject of time series is of considerable interest, especially among researchers in econometrics, engineering, and the natural sciences. As part of the prestigious Wiley Series in Probability and Statistics, this book provides a lucid introduction to the field and, in this new Second Edition, covers the important advances of recent years, including nonstationary models, nonlinear estimation, multivariate models, state space representations, and empirical model identification. New sections have also been added on the Wold decomposition, partial autocorrelation, long memory processes, and the Kalman filter. Major topics include: * Moving average and autoregressive processes * Introduction to Fourier analysis * Spectral theory and filtering * Large sample theory * Estimation of the mean and autocorrelations * Estimation of the spectrum * Parameter estimation * Regression, trend, and

seasonality * Unit root and explosive time series To accommodate a wide variety of readers, review material, especially on elementary results in Fourier analysis, large sample statistics, and difference equations, has been included.

Evolutionary Operation

This new material is concerned with the theory and applications of probability, statistics and analysis of canonical moments. It provides a powerful tool for the determination of optimal experimental designs, for the calculation of the main characteristics of random walks, and for other moment problems appearing in probability and statistics.

Introduction to Statistical Time Series

An introduction to the theory and methods of robust statistics, providing students with practical methods for carrying out robust procedures in a variety of statistical contexts and explaining the advantages of these procedures. In addition, the text develops techniques and concepts likely to be useful in the future analysis of new statistical models and procedures. Emphasizing the concepts of breakdown point and influence function of an estimator, it demonstrates the technique of expressing an estimator as a descriptive measure from which its influence function can be derived and then used to explore the efficiency and robustness properties of the estimator. Mathematical techniques are complemented by computational algorithms and Minitab macros for finding bootstrap and influence function estimates of standard errors of the estimators, robust confidence intervals, robust regression estimates and their standard errors. Includes examples and problems.

The Theory of Canonical Moments with Applications in Statistics, Probability, and Analysis

The second edition of a well-received book that was published 24 years ago and continues to sell to this day, *An Introduction to Probability and Statistics* is now revised to incorporate new information as well as substantial updates of existing material.

Robust Estimation and Testing

A practical guide for multivariate statistical techniques-- now updated and revised In recent years, innovations in computer technology and statistical methodologies have dramatically altered the landscape of multivariate data analysis. This new edition of *Methods for Statistical Data Analysis of Multivariate Observations* explores current multivariate concepts and techniques while retaining the same practical focus of its predecessor. It integrates methods and data-based interpretations relevant to multivariate analysis in a way that addresses real-world problems arising in many areas of interest. Greatly revised and updated, this Second Edition provides helpful examples, graphical orientation, numerous illustrations, and an appendix detailing statistical software, including the S (or Splus) and SAS systems. It also offers * An expanded chapter on cluster analysis that covers advances in pattern recognition * New sections on inputs to clustering algorithms and aids for interpreting the results of cluster analysis * An exploration of some new techniques of summarization and exposure * New graphical methods for assessing the separations among the eigenvalues of a correlation matrix and for comparing sets of eigenvectors * Knowledge gained from advances in robust estimation and distributional models that are slightly broader than the multivariate normal This Second Edition is invaluable for graduate students, applied statisticians, engineers, and scientists wishing to use multivariate techniques in a variety of disciplines.

An Introduction to Probability and Statistics

WILEY-INTERSCIENCE PAPERBACK SERIES The Wiley-Interscience Paperback Series consists of selected books that have been made more accessible to consumers in an effort to increase global appeal and general circulation. With these new unabridged softcover volumes, Wiley hopes to extend the lives of these works by making them available to future generations of statisticians, mathematicians, and scientists. "This book will be an aid to survey statisticians and to research workers who must work with survey data." —Short Book Reviews, International Statistical Institute *Measurement Errors in Surveys* documents the current state of the field, reports new research findings, and promotes interdisciplinary exchanges in modeling, assessing, and reducing measurement errors in surveys. Providing a fundamental approach to measurement errors, the book features sections on the questionnaire, respondents and responses, interviewers and other means of data collection, the

respondent-interviewer relationship, and the effects of measurement errors on estimation and data analysis.

Methods for Statistical Data Analysis of Multivariate Observations

Easy-to-read and comprehensive, this book shows how the SAS System performs multivariate time series analysis and features the advanced SAS procedures STATSPACE, ARIMA, and SPECTRA. The interrelationship of SAS/ETS procedures is demonstrated with an accompanying discussion of how the choice of a procedure depends on the data to be analysed and the results desired. Other topics covered include detecting sinusoidal components in time series models and performing bivariate cross-spectral analysis and comparing the results with the standard transfer function methodology. The authors' unique approach to integrating students in a variety of disciplines and industries. Emphasis is on correct interpretation of output to draw meaningful conclusions. The volume, co-published by SAS and JWS, features both theory and practicality, and accompanies a soon-to-be extensive library of SAS hands-on manuals in a multitude of statistical areas. The book can be used with a number of hardware-specific computing machines including CMS, Mac, MVS, Open VMS Alpha, Open VMS VAX, OS/390, OS/2, UNIX, and Windows.

Measurement Errors in Surveys

Spatial data analysis is a fast growing area and Voronoi diagrams provide a means of naturally partitioning space into subregions to facilitate spatial data manipulation, modelling of spatial structures, pattern recognition and locational optimization. With such versatility, the Voronoi diagram and its relative, the Delaunay triangulation, provide valuable tools for the analysis of spatial data. This is a rapidly growing research area and in this fully updated second edition the authors provide an up-to-date and comprehensive unification of all the previous literature on the subject of Voronoi diagrams. Features: * Expands on the highly acclaimed first edition * Provides an up-to-date and comprehensive survey of the existing literature on Voronoi diagrams * Includes a useful compendium of applications * Contains an extensive bibliography A wide range of applications is discussed, enabling this book to serve as an important reference volume on this topic. The text will appeal to students and researchers studying spatial data in a number of areas, in particular, applied probability, computational geometry, and Geographic Information Science (GIS). This book will appeal equally to those whose interests in Voronoi diagrams are theoretical, practical or both.

SAS for Forecasting Time Series

Applies the well-developed tools of the theory of weak convergence of probability measures to large deviation analysis--a consistent new approach The theory of large deviations, one of the most dynamic topics in probability today, studies rare events in stochastic systems. The nonlinear nature of the theory contributes both to its richness and difficulty. This innovative text demonstrates how to employ the well-established linear techniques of weak convergence theory to prove large deviation results. Beginning with a step-by-step development of the approach, the book skillfully guides readers through models of increasing complexity covering a wide variety of random variable-level and process-level problems. Representation formulas for large deviation-type expectations are a key tool and are developed systematically for discrete-time problems. Accessible to anyone who has a knowledge of measure theory and measure-theoretic probability, A Weak Convergence Approach to the Theory of Large Deviations is important reading for both students and researchers.

Spatial Tessellations

Features and capabilities of the REG, ANOVA, and GLM procedures are included in this introduction to analysing linear models with the SAS System. This guide shows how to apply the appropriate procedure to data analysis problems and understand PROC GLM output. Other helpful guidelines and discussions cover the following significant areas: Multivariate linear models; lack-of-fit analysis; covariance and heterogeneity of slopes; a classification with both crossed and nested effects; and analysis of variance for balanced data. This fourth edition includes updated examples, new software-related features, and new material, including a chapter on generalised linear models. Version 8 of the SAS System was used to run the SAS code examples in the book. * Provides clear explanations of how to use SAS to analyse linear models * Includes numerous SAS outputs * Includes new chapter on generalised linear models * Uses version 8 of the SAS system This book assists data analysts who use SAS/STAT software to analyse data using regression analysis and analysis of variance. It assumes familiarity with basic SAS

concepts such as creating SAS data sets with the DATA step and manipulating SAS data sets with the procedures in base SAS software.

A Weak Convergence Approach to the Theory of Large Deviations

Differential geometry provides an aesthetically appealing and often revealing view of statistical inference. Beginning with an elementary treatment of one-parameter statistical models and ending with an overview of recent developments, this is the first book to provide an introduction to the subject that is largely accessible to readers not already familiar with differential geometry. It also gives a streamlined entry into the field to readers with richer mathematical backgrounds. Much space is devoted to curved exponential families, which are of interest not only because they may be studied geometrically but also because they are analytically convenient, so that results may be derived rigorously. In addition, several appendices provide useful mathematical material on basic concepts in differential geometry. Topics covered include the following: * Basic properties of curved exponential families * Elements of second-order, asymptotic theory * The Fisher-Efron-Amari theory of information loss and recovery * Jeffreys-Rao information-metric Riemannian geometry * Curvature measures of nonlinearity * Geometrically motivated diagnostics for exponential family regression * Geometrical theory of divergence functions * A classification of and introduction to additional work in the field

SAS for Linear Models

The analysis of variance is presented as an exploratory component of data analysis, while retaining the customary least squares fitting methods. Balanced data layouts are used to reveal key ideas and techniques for exploration. The approach emphasizes both the individual observations and the separate parts that the analysis produces. Most chapters include exercises and the appendices give selected percentage points of the Gaussian, t , F , chi-squared and studentized range distributions.

Geometrical Foundations of Asymptotic Inference

Gives greater rigor to numerical treatments of stochastic models. Contains Monte Carlo and quasi-Monte Carlo techniques, simulation of major stochastic procedures, deterministic methods adapted to Markovian problems and special problems related to stochastic integral and differential equations. Simulation methods are given throughout the text as well as numerous exercises.

Fundamentals of Exploratory Analysis of Variance

How to conduct clinical trials in an ethical and scientifically responsible manner This book presents a methodology for clinical trials that produces improved health outcomes for patients while obtaining sound and unambiguous scientific data. It centers around a real-world test case--involving a treatment for hypertension after open heart surgery--and explains how to use Bayesian methods to accommodate both ethical and scientific imperatives. The book grew out of the direct involvement in the project by a diverse group of experts in medicine, statistics, philosophy, and the law. Not only do they contribute essays on the scientific, technological, legal, and ethical aspects of clinical trials, but they also critique and debate each other's opinions, creating an interesting, personalized text. Bayesian Methods and Ethics in a Clinical Trial Design * Answers commonly raised questions about Bayesian methods * Describes the advantages and disadvantages of this method compared with other methods * Applies current ethical theory to a particular class of design for clinical trials * Discusses issues of informed consent and how to serve a patient's best interest while still obtaining uncontaminated scientific data * Shows how to use Bayesian probabilistic methods to create computer models from elicited prior opinions of medical experts on the best treatment for a type of patient * Contains several chapters on the process, results, and computational aspects of the test case in question * Explores American law and the legal ramifications of using human subjects For statisticians and biostatisticians, and for anyone involved with medicine and public health, this book provides both a practical guide and a unique perspective on the connection between technological developments, human factors, and some of the larger ethical issues of our times.

Numerical Methods for Stochastic Processes

A Probabilistic Analysis of the Sacco and Vanzetti Evidence is a Bayesian analysis of the trial and post-trial evidence in the Sacco and Vanzetti case, based on subjectively determined probabilities and assumed relationships among evidential events. It applies the ideas of charting evidence and probabilis-

tic assessment to this case, which is perhaps the ranking cause celebre in all of American legal history. Modern computation methods applied to inference networks are used to show how the inferential force of evidence in a complicated case can be graded. The authors employ probabilistic assessment to obtain opinions about how influential each group of evidential items is in reaching a conclusion about the defendants' innocence or guilt. A Probabilistic Analysis of the Sacco and Vanzetti Evidence holds particular interest for statisticians and probabilists in academia and legal consulting, as well as for the legal community, historians, and behavioral scientists. It combines structural and probabilistic ideas in the analysis of masses of evidence from every recognized logical species of evidence. Twenty-eight charts show the chains of reasoning in defense of the relevance of evidentiary matters and a listing of trial witnesses who provided the evidence. References include nearly 300 items drawn from the fields of probability theory, history, law, artificial intelligence, psychology, literature, and other areas.

Bayesian Methods and Ethics in a Clinical Trial Design

Wiley Series in Probability and Statistics A modern perspective on mixed models The availability of powerful computing methods in recent decades has thrust linear and nonlinear mixed models into the mainstream of statistical application. This volume offers a modern perspective on generalized, linear, and mixed models, presenting a unified and accessible treatment of the newest statistical methods for analyzing correlated, nonnormally distributed data. As a follow-up to Searle's classic, Linear Models, and Variance Components by Searle, Casella, and McCulloch, this new work progresses from the basic one-way classification to generalized linear mixed models. A variety of statistical methods are explained and illustrated, with an emphasis on maximum likelihood and restricted maximum likelihood. An invaluable resource for applied statisticians and industrial practitioners, as well as students interested in the latest results, Generalized, Linear, and Mixed Models features:

- * A review of the basics of linear models and linear mixed models
- * Descriptions of models for nonnormal data, including generalized linear and nonlinear models
- * Analysis and illustration of techniques for a variety of real data sets
- * Information on the accommodation of longitudinal data using these models
- * Coverage of the prediction of realized values of random effects
- * A discussion of the impact of computing issues on mixed models

Catalog of Copyright Entries. Third Series

The first step-by-step guide to conducting successful Chi-squared tests Chi-squared testing is one of the most commonly applied statistical techniques. It provides reliable answers for researchers in a widerange of fields, including engineering, manufacturing, finance, agriculture, and medicine. A Guide to Chi-Squared Testing brings readers up to date on recent innovations and important material previously published only in the former Soviet Union. Its clear, concise treatment and practical advice make this an ideal reference for all researchers and consultants. Authors Priscilla E. Greenwood and Mikhail S. Nikulin demonstrate the application of these general purpose tests in a wide variety of specific settings. They also

- * Detail the various decisions to be made when applying Chi-squared tests to real data, and the proper application of these tests in standard hypothesis-testing situations
- * Describe how Chi-squared type tests allow statisticians to construct a test statistic whose distribution is asymptotically Chi-squared, and to compute power against various alternatives
- * Devote half of the book to examples of Chi-squared tests that can be easily adapted to situations not covered in the book
- * Provide a self-contained, accessible treatment of the mathematical requisites
- * Include an extensive bibliography and suggestions for further reading

A Probabilistic Analysis of the Sacco and Vanzetti Evidence

Zur graphischen Präsentation von Regressionsdaten gibt es seit dem Vormarsch der Computertechnik vielfältige neue Möglichkeiten, die über die klassischen Ansätze hinausgehen. Der Autor betritt mit seinen Ideen häufig Neuland; er illustriert sie mit zahlreichen Beispielen, Diagrammen und Abbildungen (die entsprechenden 3D- und Farbversionen sind über Internet abrufbar). (11/98)

Generalized, Linear, and Mixed Models

Comparing and contrasting the reality of subjectivity in the work of history's great scientists and the modern Bayesian approach to statistical analysis Scientists and researchers are taught to analyze their data from an objective point of view, allowing the data to speak for themselves rather than assigning them meaning based on expectations or opinions. But scientists have never behaved fully objectively. Throughout history, some of our greatest scientific minds have relied on intuition, hunches, and personal beliefs to make sense of empirical data-and these subjective influences have often

aided in humanity's greatest scientific achievements. The authors argue that subjectivity has not only played a significant role in the advancement of science, but that science will advance more rapidly if the modern methods of Bayesian statistical analysis replace some of the classical twentieth-century methods that have traditionally been taught. To accomplish this goal, the authors examine the lives and work of history's great scientists and show that even the most successful have sometimes misrepresented findings or been influenced by their own preconceived notions of religion, metaphysics, and the occult, or the personal beliefs of their mentors. Contrary to popular belief, our greatest scientific thinkers approached their data with a combination of subjectivity and empiricism, and thus informally achieved what is more formally accomplished by the modern Bayesian approach to data analysis. Yet we are still taught that science is purely objective. This innovative book dispels that myth using historical accounts and biographical sketches of more than a dozen great scientists, including Aristotle, Galileo Galilei, Johannes Kepler, William Harvey, Sir Isaac Newton, Antoine Levoisier, Alexander von Humboldt, Michael Faraday, Charles Darwin, Louis Pasteur, Gregor Mendel, Sigmund Freud, Marie Curie, Robert Millikan, Albert Einstein, Sir Cyril Burt, and Margaret Mead. Also included is a detailed treatment of the modern Bayesian approach to data analysis. Up-to-date references to the Bayesian theoretical and applied literature, as well as reference lists of the primary sources of the principal works of all the scientists discussed, round out this comprehensive treatment of the subject. Readers will benefit from this cogent and enlightening view of the history of subjectivity in science and the authors' alternative vision of how the Bayesian approach should be used to further the cause of science and learning well into the twenty-first century.

A Guide to Chi-Squared Testing

An outstanding introduction to the fundamentals of regression analysis—updated and expanded The methods of regression analysis are the most widely used statistical tools for discovering the relationships among variables. This classic text, with its emphasis on clear, thorough presentation of concepts and applications, offers a complete, easily accessible introduction to the fundamentals of regression analysis. Assuming only a basic knowledge of elementary statistics, *Applied Regression Analysis, Third Edition* focuses on the fitting and checking of both linear and nonlinear regression models, using small and large data sets, with pocket calculators or computers. This Third Edition features separate chapters on multicollinearity, generalized linear models, mixture ingredients, geometry of regression, robust regression, and resampling procedures. Extensive support materials include sets of carefully designed exercises with full or partial solutions and a series of true/false questions with answers. All data sets used in both the text and the exercises can be found on the companion disk at the back of the book. For analysts, researchers, and students in university, industrial, and government courses on regression, this text is an excellent introduction to the subject and an efficient means of learning how to use a valuable analytical tool. It will also prove an invaluable reference resource for applied scientists and statisticians.

Regression Graphics

Bringing together business and engineering to reliability analysis With manufactured products exploding in numbers and complexity, reliability studies play an increasingly critical role throughout a product's entire life cycle—from design to post-sale support. *Reliability: Modeling, Prediction, and Optimization* presents a remarkably broad framework for the analysis of the technical and commercial aspects of product reliability, integrating concepts and methodologies from such diverse areas as engineering, materials science, statistics, probability, operations research, and management. Written in plain language by two highly respected experts in the field, this practical work provides engineers, operations managers, and applied statisticians with both qualitative and quantitative tools for solving a variety of complex, real-world reliability problems. A wealth of examples and case studies accompanies:

- * Comprehensive coverage of assessment, prediction, and improvement at each stage of a product's life cycle
- * Clear explanations of modeling and analysis for hardware ranging from a single part to whole systems
- * Thorough coverage of test design and statistical analysis of reliability data
- * A special chapter on software reliability
- * Coverage of effective management of reliability, product support, testing, pricing, and related topics
- * Lists of sources for technical information, data, and computer programs
- * Hundreds of graphs, charts, and tables, as well as over 500 references
- * PowerPoint slides are available from the Wiley editorial department.

The Subjectivity of Scientists and the Bayesian Approach

A broad and unified methodology for robust statistics—with exciting new applications Robust statistics is one of the fastest growing fields in contemporary statistics. It is also one of the more diverse and sometimes confounding areas, given the many different assessments and interpretations of robustness by theoretical and applied statisticians. This innovative book unifies the many varied, yet related, concepts of robust statistics under a sound theoretical modulation. It seamlessly integrates asymptotics and interrelations, and provides statisticians with an effective system for dealing with the interrelations between the various classes of procedures. Drawing on the expertise of researchers from around the world, and covering over a decade's worth of developments in the field, *Robust Statistical Procedures: Asymptotics and Interrelations* Discusses both theory and applications in its two parts, from the fundamentals to robust statistical inference Thoroughly explores the interrelations between diverse classes of procedures, unlike any other book Compares nonparametric procedures with robust statistics, explaining in detail asymptotic representations for various estimators Provides a timesaving list of mathematical tools for the problems under discussion Keeps mathematical abstractions to a minimum, in spite of its largely theoretical content Includes useful problems and exercises at the end of each chapter Offers strategies for more complex models when using robust statistical procedures Self-contained and rounded in approach, this book is invaluable for both applied statisticians and theoretical researchers; for graduate students in mathematical statistics; and for anyone interested in the influence of this methodology.

Applied Regression Analysis

A vivid, hands-on discussion of the statistical methods in imaging, optics, and photonics applications In the field of imaging science, there is a growing need for students and practitioners to be equipped with the necessary knowledge and tools to carry out quantitative analysis of data. Providing a self-contained approach that is not too heavily statistical in nature, *Statistics for Imaging, Optics, and Photonics* presents necessary analytical techniques in the context of real examples from various areas within the field, including remote sensing, color science, printing, and astronomy. Bridging the gap between imaging, optics, photonics, and statistical data analysis, the author uniquely concentrates on statistical inference, providing a wide range of relevant methods. Brief introductions to key probabilistic terms are provided at the beginning of the book in order to present the notation used, followed by discussions on multivariate techniques such as: Linear regression models, vector and matrix algebra, and random vectors and matrices Multivariate statistical inference, including inferences about both mean vectors and covariance matrices Principal components analysis Canonical correlation analysis Discrimination and classification analysis for two or more populations and spatial smoothing Cluster analysis, including similarity and dissimilarity measures and hierarchical and nonhierarchical clustering methods Intuitive and geometric understanding of concepts is emphasized, and all examples are relatively simple and include background explanations. Computational results and graphs are presented using the freely available R software, and can be replicated by using a variety of software packages. Throughout the book, problem sets and solutions contain partial numerical results, allowing readers to confirm the accuracy of their approach; and a related website features additional resources including the book's datasets and figures. *Statistics for Imaging, Optics, and Photonics* is an excellent book for courses on multivariate statistics for imaging science, optics, and photonics at the upper-undergraduate and graduate levels. The book also serves as a valuable reference for professionals working in imaging, optics, and photonics who carry out data analyses in their everyday work.

Reliability

Presents a detailed exposition of statistical intervals and emphasizes applications in industry. The discussion differentiates at an elementary level among different kinds of statistical intervals and gives instruction with numerous examples and simple math on how to construct such intervals from sample data. This includes confidence intervals to contain a population percentile, confidence intervals on probability of meeting specified threshold value, and prediction intervals to include observation in a future sample. Also has an appendix containing computer subroutines for nonparametric statistical intervals.

Robust Statistical Procedures

A comprehensive, step-by-step introduction to wavelets in statistics. What are wavelets? What makes them increasingly indispensable in statistical nonparametrics? Why are they suitable for "time-scale" applications? How are they used to solve such problems as denoising, regression, or density estima-

tion? Where can one find up-to-date information on these newly "discovered" mathematical objects? These are some of the questions Brani Vidakovic answers in *Statistical Modeling by Wavelets*. Providing a much-needed introduction to the latest tools afforded statisticians by wavelet theory, Vidakovic compiles, organizes, and explains in depth research data previously available only in disparate journal articles. He carefully balances both statistical and mathematical techniques, supplementing the material with a wealth of examples, more than 100 illustrations, and extensive references-with data sets and S-Plus wavelet overviews made available for downloading over the Internet. Both introductory and data-oriented modeling topics are featured, including:

- * Continuous and discrete wavelet transformations.
- * Statistical optimality properties of wavelet shrinkage.
- * Theoretical aspects of wavelet density estimation.
- * Bayesian modeling in the wavelet domain.
- * Properties of wavelet-based random functions and densities.
- * Several novel and important wavelet applications in statistics.
- * Wavelet methods in time series.

Accessible to anyone with a background in advanced calculus and algebra, *Statistical Modeling by Wavelets* promises to become the standard reference for statisticians and engineers seeking a comprehensive introduction to an emerging field.

Statistics for Imaging, Optics, and Photonics

Relevant, concrete, and thorough--the essential data-based text on statistical inference The ability to formulate abstract concepts and draw conclusions from data is fundamental to mastering statistics. *Aspects of Statistical Inference* equips advanced undergraduate and graduate students with a comprehensive grounding in statistical inference, including nonstandard topics such as robustness, randomization, and finite population inference. A. H. Welsh goes beyond the standard texts and expertly synthesizes broad, critical theory with concrete data and relevant topics. The text follows a historical framework, uses real-data sets and statistical graphics, and treats multiparameter problems, yet is ultimately about the concepts themselves. Written with clarity and depth, *Aspects of Statistical Inference*:

- * Provides a theoretical and historical grounding in statistical inference that considers Bayesian, fiducial, likelihood, and frequentist approaches
- * Illustrates methods with real-data sets on diabetic retinopathy, the pharmacological effects of caffeine, stellar velocity, and industrial experiments
- * Considers multiparameter problems
- * Develops large sample approximations and shows how to use them
- * Presents the philosophy and application of robustness theory
- * Highlights the central role of randomization in statistics
- * Uses simple proofs to illuminate foundational concepts
- * Contains an appendix of useful facts concerning expansions, matrices, integrals, and distribution theory

Here is the ultimate data-based text for comparing and presenting the latest approaches to statistical inference.

Statistical Intervals

How to apply statistical methods to survey data--a guide to effective analysis of health surveys. With large health surveys becoming increasingly available for public use, researchers with little experience in survey methods are often faced with analyzing data from surveys to address scientific and programmatic questions. This practical book provides statistical techniques for use in survey analysis, making health surveys accessible to statisticians, biostatisticians, epidemiologists, and health researchers. The authors clearly explain the theory and methods of survey analysis along with real-world applications. They draw on their work at the National Institutes of Health as well as up-to-date information from across the literature to present:

- * The sampling background necessary to understand health surveys.
- * The application of such techniques as t-tests, linear regression, logistic regression, and survival analysis to survey data.
- * The use of sample weights in survey data analysis.
- * Dealing with complications in variance estimation in large health surveys.
- * Applications involving cross-sectional, longitudinal, and multiple cross-sectional surveys, and the use of surveys to perform population-based case-control analyses.
- * Guidance on the correct use of statistical methods found in software packages.
- * Extensive bibliography.

Statistical Modeling by Wavelets

Statistical Factor Analysis and Related Methods Theory and Applications In bridging the gap between the mathematical and statistical theory of factor analysis, this new work represents the first unified treatment of the theory and practice of factor analysis and latent variable models. It focuses on such areas as:

- * The classical principal components model and sample-population inference
- * Several extensions and modifications of principal components, including Q and three-mode analysis and principal components in the complex domain
- * Maximum likelihood and weighted factor models, factor identification, factor rotation, and the estimation of factor scores
- * The use of factor models in

conjunction with various types of data including time series, spatial data, rank orders, and nominal variable * Applications of factor models to the estimation of functional forms and to least squares of regression estimators

Aspects of Statistical Inference

The Wiley-Interscience Paperback Series consists of selected books that have been made more accessible to consumers in an effort to increase global appeal and general circulation. With these new unabridged softcover volumes, Wiley hopes to extend the lives of these works by making them available to future generations of statisticians, mathematicians, and scientists. "The effort of Professor Fuller is commendable . . . [the book] provides a complete treatment of an important and frequently ignored topic. Those who work with measurement error models will find it valuable. It is the fundamental book on the subject, and statisticians will benefit from adding this book to their collection or to university or departmental libraries." -Biometrics "Given the large and diverse literature on measurement error/errors-in-variables problems, Fuller's book is most welcome. Anyone with an interest in the subject should certainly have this book." -Journal of the American Statistical Association "The author is to be commended for providing a complete presentation of a very important topic. Statisticians working with measurement error problems will benefit from adding this book to their collection." -Technometrics " . . . this book is a remarkable achievement and the product of impressive top-grade scholarly work." -Journal of Applied Econometrics Measurement Error Models offers coverage of estimation for situations where the model variables are observed subject to measurement error. Regression models are included with errors in the variables, latent variable models, and factor models. Results from several areas of application are discussed, including recent results for nonlinear models and for models with unequal variances. The estimation of true values for the fixed model, prediction of true values under the random model, model checks, and the analysis of residuals are addressed, and in addition, procedures are illustrated with data drawn from nearly twenty real data sets.

Analysis of Health Surveys

Sequential Stochastic Optimization provides mathematicians and applied researchers with a well-developed framework in which stochastic optimization problems can be formulated and solved. Offering much material that is either new or has never before appeared in book form, it lucidly presents a unified theory of optimal stopping and optimal sequential control of stochastic processes. This book has been carefully organized so that little prior knowledge of the subject is assumed; its only prerequisites are a standard graduate course in probability theory and some familiarity with discrete-parameter martingales. Major topics covered in Sequential Stochastic Optimization include: * Fundamental notions, such as essential supremum, stopping points, accessibility, martingales and supermartingales indexed by \mathbb{N} * Conditions which ensure the integrability of certain suprema of partial sums of arrays of independent random variables * The general theory of optimal stopping for processes indexed by \mathbb{N} * Structural properties of information flows * Sequential sampling and the theory of optimal sequential control * Multi-armed bandits, Markov chains and optimal switching between random walks

Statistical Factor Analysis and Related Methods

Design and analysis of experiments/Hinkelmann.-v.1.

Measurement Error Models

The latest computer assisted methods for survey research Computer assisted survey information collection (CASIC) methods are rapidly replacing traditional "paper and pencil" survey procedures. Researchers now apply computer technologies at every step of the survey process, from automating interviews and computerizing data collection to data capture and preparation. CASIC techniques are reshaping today's survey research and methodology --and redefining tomorrow's. Computer Assisted Survey Information Collection is the most up-to-date and authoritative resource available on CASIC methods and issues. Its comprehensive treatment provides the scope needed to evaluate past development and implementation of CASIC designs, to anticipate its future directions, and to identify new areas for research and development. Written in an array of evidentiary styles by more than 60 leading CASIC practitioners from numerous disciplines, this coherently organized volume: * Covers CASIC development and its integration into existing designs and organizations * Discusses instrument development and design * Examines survey design issues, including the incorporation of experiments * Discusses case management of automated survey systems * Evaluates training and supervision of

computer assisted interviewers * Reviews self-administered surveys, including optically scannable mail surveys * Considers emerging technologies, such as voice recognition, pen-CASIC, and the Web as a data collection tool. Supplemented with copious tables, figures, and references as well as an extensive glossary, Computer Assisted Survey Information Collection provides a solid foundation in CASIC for seasoned research-survey practitioners and graduate students across a broad spectrum of social science disciplines.

Sequential Stochastic Optimization

Design and Analysis of Experiments, Introduction to Experimental Design