Bilinear Forms And Zonal Polynomials

#bilinear forms #zonal polynomials #linear algebra #multivariate statistics #special functions

Explore the fundamental concepts of bilinear forms and zonal polynomials, key elements in advanced mathematics and statistics. This resource delves into the theoretical underpinnings of bilinear mappings within linear algebra and examines the crucial role of zonal polynomials as special functions in multivariate analysis and representation theory, offering a comprehensive overview for researchers and students alike.

Bilinear Forms and Zonal Polynomials

The book deals with bilinear forms in real random vectors and their generalizations as well as zonal polynomials and their applications in handling generalized quadratic and bilinear forms. The book is mostly self-contained. It starts from basic principles and brings the readers to the current research level in these areas. It is developed with detailed proofs and illustrative examples for easy readability and self-study. Several exercises are proposed at the end of the chapters. The complicated topic of zonal polynomials is explained in detail in this book. The book concentrates on the theoretical developments in all the topics covered. Some applications are pointed out but no detailed application to any particular field is attempted. This book can be used as a textbook for a one-semester graduate course on quadratic and bilinear forms and/or on zonal polynomials. It is hoped that this book will be a valuable reference source for graduate students and research workers in the areas of mathematical statistics, quadratic and bilinear forms and their generalizations, zonal polynomials, invariant polynomials and related topics, and will benefit statisticians, mathematicians and other theoretical and applied scientists who use any of the above topics in their areas. Chapter 1 gives the preliminaries needed in later chapters, including some Jacobians of matrix transformations. Chapter 2 is devoted to bilinear forms in Gaussian real ran dom vectors, their properties, and techniques specially developed to deal with bilinear forms where the standard methods for handling quadratic forms become complicated.

Bilinear Forms and Zonal Polynomials

This book is a printed edition of the Special Issue "Special Functions: Fractional Calculus and the Pathway for Entropy Dedicated to Professor Dr. A.M. Mathai on the occasion of his 80th Birthday" that was published in Axioms

Special Functions: Fractional Calculus and the Pathway for Entropy

In order not to intimidate students by a too abstract approach, this textbook on linear algebra is written to be easy to digest by non-mathematicians. It introduces the concepts of vector spaces and mappings between them without dwelling on statements such as theorems and proofs too much. It is also designed to be self-contained, so no other material is required for an understanding of the topics covered. As the basis for courses on space and atmospheric science, remote sensing, geographic information systems, meteorology, climate and satellite communications at UN-affiliated regional centers, various applications of the formal theory are discussed as well. These include differential equations, statistics, optimization and some engineering-motivated problems in physics. Contents Vectors Matrices Determinants Eigenvalues and eigenvectors Some applications of matrices and determinants Matrix series and additional properties of matrices

Linear Algebra

At the International Indian Statistical Association Conference, held at McMaster University in Ontario, Canada, participants focused on advancements in theory and methodology of probability and statistics. This is one of two volumes containing invited papers from the meeting. The 32 chapters deal with different topics of interest, including stochastic processes and inference, distributions and characterizations, inference, Bayesian inference, selection methods, regression methods, and methods in health research. The text is ideal for applied mathematicians, statisticians, and researchers in the field.

Advances on Theoretical and Methodological Aspects of Probability and Statistics

This book concentrates on the topic of evaluation of Jacobians in some specific linear as well as nonlinear matrix transformations, in the real and complex cases, which are widely applied in the statistical, physical, engineering, biological and social sciences. It aims to develop some techniques systematically so that anyone with a little exposure to multivariable calculus can easily follow the steps and understand the various methods by which the Jacobians in complicated matrix transformations are evaluated. The material is developed slowly, with lots of worked examples, aimed at self-study. Some exercises are also given, at the end of each section.The book is a valuable reference for statisticians, engineers, physicists, econometricians, applied mathematicians and people working in many other areas. It can be used for a one-semester graduate level course on Jacobians and functions of matrix argument.

Jacobians Of Matrix Transformation And Functions Of Matrix Arguments

This reissued classic text is the acclaimed second edition of Professor Ian Macdonald's groundbreaking monograph on symmetric functions and Hall polynomials. The first edition was published in 1979, before being significantly expanded into the present edition in 1995. This text is widely regarded as the best source of information on Hall polynomials and what have come to be known as Macdonald polynomials, central to a number of key developments in mathematics and mathematical physics in the 21st century Macdonald polynomials gave rise to the subject of double affine Hecke algebras (or Cherednik algebras) important in representation theory. String theorists use Macdonald polynomials to attack the so-called AGT conjectures. Macdonald polynomials have been recently used to construct knot invariants. They are also a central tool for a theory of integrable stochastic models that have found a number of applications in probability, such as random matrices, directed polymers in random media, driven lattice gases, and so on. Macdonald polynomials have become a part of basic material that a researcher simply must know if (s)he wants to work in one of the above domains, ensuring this new edition will appeal to a very broad mathematical audience. Featuring a new foreword by Professor Richard Stanley of MIT.

Symmetric Functions and Hall Polynomials

This book offers an introduction to concepts of probability theory, probability distributions relevant in the applied sciences, as well as basics of sampling distributions, estimation and hypothesis testing. As a companion for classes for engineers and scientists, the book also covers applied topics such as model building and experiment design. Contents Random phenomena Probability Random variables Expected values Commonly used discrete distributions Commonly used density functions Joint distributions Some multivariate distributions Collection of random variables Sampling distributions Estimation

Interval estimation Tests of statistical hypotheses Model building and regression Design of experiments and analysis of variance Questions and answers

Probability and Statistics

TheH-function or popularly known in the literature as Fox'sH-function has recently found applications in a large variety of problems connected with reaction, diffusion, reaction–diffusion, engineering and communication, fractional differ- tial and integral equations, many areas of theoretical physics, statistical distribution theory, etc. One of the standard books and most cited book on the topic is the 1978 book of Mathai and Saxena. Since then, the subject has grown a lot, mainly in the elds of applications. Due to popular demand, the authors were requested to - grade and bring out a revised edition of the 1978 book. It was decided to bring out a new book, mostly dealing with recent applications in statistical distributions, pa- way models, nonextensive statistical mechanics, astrophysics problems, fractional calculus, etc. and to make use of the expertise of Hans J. Haubold in astrophysics area also. It was decided to con ne the discussion toH-function of one scalar variable only. Matrix variable cases and many variable cases are not discussed in detail, but an insight into these areas is given. When going from one variable to many variables, there is nothing called a unique bivariate or multivariate analogue of a givenfunction. Whatever be the criteria used, there may be manydifferentfunctions quali ed to be bivariate or multivariate analogues of a given univariate function. Some of the bivariate and multivariateH-functions, currently in the literature, are also questioned by many authors.

The H-Function

A useful guide for researchers and professionals, graduate and senior undergraduate students, this book provides an in-depth look at applied and geometrical probability with an emphasis on statistical distributions. A meticulous treatment of geometrical probability, kept at a level to appeal to a wider audience including applied researchers who will find the book to be both functional and practical with the large number of problems chosen from different disciplines A few topics such as packing and covering problems that have a vast literature are introduced here at a peripheral level for the purpose of familiarizing readers who are new to the area of research.

An Introduction to Geometrical Probability

FRACTIONAL CALCULUS: Theory and Applications deals with differentiation and integration of arbi- trary order. The origin of this subject can be traced back to the end of seventeenth century, the time when Newton and Leibniz developed foundations of differential and integral calculus. Nonetheless, utility and applicability of FC to various branches of science and engineering have been realized only in last few decades. Recent years have witnessed tremendous upsurge in research activities related to the applications of FC in modeling of real-world systems. Unlike the derivatives of integral order, the non-lo- cal nature of fractional derivatives correctly models many natural phenomena containing long memory and give more accurate description than their integer counterparts.The present book comprises of contributions from academicians and leading researchers and gives a panoramic overview of various aspects of this subject: Introduction to Fractional Calculus Fractional Differential Equations Fractional Ordered Dynamical Systems Fractional Operators on Fractals Local Fractional Derivatives Fractional Control Systems Fractional Operators and Statistical Distributions Applications to Engineering

Fractional Calculus

The aim of this book is to make a comprehensive review on some of the research topics in the area of survey sampling which has not been covered in any book yet. The proposed book aims at making a comprehensive review of applications of Bayes procedures, Empirical Bayes procedures and their ramifications (like linear Bayes estimation, restricted Bayes least square prediction, constrained Bayes estimation, Bayesian robustness) in making inference from a finite population sampling. Parimal Mukhopadhyay is Professor at the Indian Statistical Institute (ISI), Calcutta. He received his Ph.D. degree in Statistics from the University of Calcutta in 1977. He also served as a faculty member in the University of Ife, Nigeria, Moi University, Kenya, University of South Pacific, Fiji Islands and held visiting positions at University of Montreal, University of Windsor, Stockholm University, University of Western Australia, etc. He has to his credit more than fifty research papers in Survey Sampling, some co-authored, three text books on Statistics and three research monographs in Survey Sampling. He is a member of the Institute of Mathematical Statistics and an elected member of the International Statistical Institute.

Topics in Survey Sampling

Correlated data arise in numerous contexts across a wide spectrum of subject-matter disciplines. Modeling such data present special challenges and opportunities that have received increasing scrutiny by the statistical community in recent years. In October 1996 a group of 210 statisticians and other sci- entists assembled on the small island of Nantucket, U. S. A. , to present and discuss new developments relating to Modelling Longitudinal and Spatially Correlated Data: Methods, Applications, and Future Direc tions. Its purpose was to provide a cross-disciplinary forum to explore the commonalities and meaningful differences in the source and treatment of such data. This volume is a compilation of some of the important invited and volunteered presentations made during that conference. The three days and evenings of oral and displayed presentations were arranged into six broad thematic areas. The session themes, the invited speakers and the topics they addressed were as follows: • Generalized Linear Models: Peter McCullagh-"Residual Likelihood in Linear and Generalized Linear Models" • Longitudinal Data Analysis: Nan Laird-"Using the General Linear Mixed Model to Analyze Unbalanced Repeated Measures and Longi tudinal Data" • Spatio---Temporal Processes: David R. Brillinger-"Statistical Analy sis of the Tracks of Moving Particles" • Spatial Data Analysis: Noel A. Cressie-"Statistical Models for Lat tice Data" • Modelling Messy Data: Raymond J. Carroll-"Some Results on Gen eralized Linear Mixed Models with Measurement Error in Covariates" • Future Directions: Peter J.

Modelling Longitudinal and Spatially Correlated Data

This third volume of case studies presents detailed applications of Bayesian statistical analysis, emphasising the scientific context. The papers were presented and discussed at a workshop held at Carnegie-Mellon University, and this volume - dedicated to the memory of Morrie Groot-reproduces six invited papers, each with accompanying invited discussion, and nine contributed papers with the focus on econometric applications.

Case Studies in Bayesian Statistics

Bayesian and such approaches to inference have a number of points of close contact, especially from an asymptotic point of view. Both emphasize the construction of interval estimates of unknown parameters. In this volume, researchers present recent work on several aspects of Bayesian, likelihood and empirical Bayes methods, presented at a workshop held in Montreal, Canada. The goal of the workshop was to explore the linkages among the methods, and to suggest new directions for research in the theory of inference.

Empirical Bayes and Likelihood Inference

This book, written by a highly distinguished author, provides the required mathematical tools for researchers active in the physical sciences. The book presents a full suit of elementary functions for scholars at PhD level. The opening chapter introduces elementary classical special functions. The final chapter is devoted to the discussion of functions of matrix argument in the real case. The text and exercises have been class-tested over five different years.

Special Functions for Applied Scientists

A compilation of original articles by Bayesian experts, this volume presents perspectives on recent developments on nonparametric and semiparametric methods in Bayesian statistics. The articles discuss how to conceptualize and develop Bayesian models using rich classes of nonparametric and semiparametric methods, how to use modern computational tools to summarize inferences, and how to apply these methodologies through the analysis of case studies.

Practical Nonparametric and Semiparametric Bayesian Statistics

This book presents a method of establishing explicit solutions to classical problems of calculating the best lower and upper mean-variance bounds. The following families of distributions are taken into account: arbitrary, symmetric, symmetric unimodal, and U-shaped. The book is addressed to students, researchers, and practitioners in statistics and applied probability. Most of the results are recent, and a significant part of them has not been published yet. Numerous open problems are stated in the text.

Projecting Statistical Functionals

This work is devoted to several problems of parametric (mainly) and nonparametric estimation through the observation of Poisson processes defined on general spaces. Poisson processes are quite popular in applied research and therefore they attract the attention of many statisticians. There are a lot of good books on point processes and many of them contain chapters devoted to statistical inference for general and partic ular models of processes. There are even chapters on statistical estimation problems for inhomogeneous Poisson processes in asymptotic statements. Nevertheless it seems that the asymptotic theory of estimation for nonlinear models of Poisson processes needs some development. Here nonlinear means the models of inhomogeneous Pois son processes with intensity function nonlinearly depending on unknown parameters. In such situations the estimators usually cannot be written in exact form and are given as solutions of some equations. However the models can be quite fruitful in en gineering problems and the existing computing algorithms are sufficiently powerful to calculate these estimators. Therefore the properties of estimators can be interesting too.

Statistical Inference for Spatial Poisson Processes

The mathematical theory of ondelettes (wavelets) was developed by Yves Meyer and many collab- orators about 10 years ago. It was designed for ap proximation of possibly irregular functions and surfaces and was successfully applied in data compression, turbulence analysis, image and signal process ing. Five years ago wavelet theory progressively appeared to be a power ful framework for nonparametric statistical problems. Efficient computa tional implementations are beginning to surface in this second lustrum of the nineties. This book brings together these three main streams of wavelet theory. It presents the theory, discusses approximations and gives a variety of statistical applications. It is the aim of this text to introduce the novice in this field into the various aspects of wavelets. Wavelets require a highly interactive computing interface. We present therefore all applications with software code from an interactive statistical computing environment. Readers interested in theory and construction of wavelets will find here in a condensed form results that are somewhat scattered around in the research literature. A practioner will be able to use wavelets via the available software code. We hope therefore to address both theory and practice with this book and thus help to construct bridges between the different groups of scientists. This te. xt grew out of a French-German cooperation (Seminaire Paris Berlin, Seminar Berlin-Paris). This seminar brings together theoretical and applied statisticians from Berlin and Paris. This work originates in the first of these seminars organized in Garchy, Burgundy in 1994.

Wavelets, Approximation, and Statistical Applications

Statistical disclosure control is the discipline that deals with producing statistical data that are safe enough to be released to external researchers. This book concentrates on the methodology of the area. It deals with both microdata (individual data) and tabular (aggregated) data. The book attempts to develop the theory from what can be called the paradigm of statistical confidentiality: to modify unsafe data in such a way that safe (enough) data emerge, with minimum information loss. This book discusses what safe data, are, how information loss can be measured, and how to modify the data in a (near) optimal way. Once it has been decided how to measure safety and information loss, the production of safe data from unsafe data is often a matter of solving an optimization problem. Several such problems are discussed in the book, and most of them turn out to be hard problems that can be solved only approximately. The authors present new results that have not been published before.

The book is not a description of an area that is closed, but, on the contrary, one that still has many spots awaiting to be more fully explored. Some of these are indicated in the book. The book will be useful for official, social and medical statisticians and others who are involved in releasing personal or business data for statistical use. Operations researchers may be interested in the optimization problems involved, particularly for the challenges they present. Leon Willenborg has worked at the Department of Statistical Methods at Statistics Netherlands since 1983, first as a researcher and since 1989 as a senior researcher. Since 1989 his main field of research and consultancy has been statistical disclosure control. From 1996-1998 he was the project coordinator of the EU co-funded SDC project.

Elements of Statistical Disclosure Control

These notes represent our summary of much of the recent research that has been done in recent years on approximations and bounds that have been developed for compound distributions and related quantities which are of interest in insurance and other areas of application in applied probability. The basic technique employed in the derivation of many bounds is induc tive, an approach that is motivated by arguments used by Sparre-Andersen (1957) in connection with a renewal risk model in insurance. This technique is both simple and powerful, and yields quite general results. The bounds themselves are motivated by the classical Lundberg exponential bounds which apply to ruin probabilities, and the connection to compound dis tributions is through the interpretation of the ruin probability as the tail probability of a compound geometric distribution. The initial exponential bounds were given in Willmot and Lin (1994), followed by the nonexpo nential generalization in Willmot (1994). Other related work on approximations for compound distributions and applications to various problems in insurance in particular and applied probability in general is also discussed in subsequent chapters. The results obtained or the arguments employed in these situations are similar to those for the compound distributions, and thus we felt it useful to include them in the notes. In many cases we have included exact results, since these are useful in conjunction with the bounds and approximations developed.

Lundberg Approximations for Compound Distributions with Insurance Applications

This book consists of three parts: Part One is composed of two introductory chapters. The first chapter provides an instrumental varible interpretation of the state space time series algorithm originally proposed by Aoki (1983), and gives an introductory account for incorporating exogenous signals in state space models. The second chapter, by Havenner, gives practical guidance in apply ing this algorithm by one of the most experienced practitioners of the method. Havenner begins by summarizing six reasons state space methods are advanta geous, and then walks the reader through construction and evaluation of a state space model for four monthly macroeconomic series: industrial production in dex, consumer price index, six month commercial paper rate, and money stock (Ml). To single out one of the several important insights in modeling that he shares with the reader, he discusses in Section 2ii the effects of sampling er rors and model misspecification on successful modeling efforts. He argues that model misspecification is an important amplifier of the effects of sampling error that may cause symplectic matrices to have complex unit roots, a theoretical impossibility. Correct model specifications increase efficiency of estimators and often eliminate this finite sample problem. This is an important insight into the positive realness of covariance matrices; positivity has been emphasized by system engineers to the exclusion of other methods of reducing sampling error and alleviating what is simply a finite sample problem. The second and third parts collect papers that describe specific applications.

Applications of Computer Aided Time Series Modeling

This book is written in the hope that it will serve as a companion volume to my first monograph. The first monograph was largely devoted to the probabilistic aspects of the inverse Gaussian law and therefore ignored the statistical issues and related data analyses. Ever since the appearance of the book by Chhikara and Folks, a considerable number of publications in both theory and applications of the inverse Gaussian law have emerged thereby justifying the need for a comprehensive treatment of the issues involved. This book is divided into two sections and fills up the gap updating the material found in the book of Chhikara and Folks. Part I contains seven chapters and covers distribution theory, estimation, significance tests, goodness-of-fit, sequential analysis and compound laws and mixtures. The first part forms the backbone of the theory and wherever possible I have provided illustrative examples for easy assimilation of the theory. The second part is devoted to a wide range of applications from various disciplines. The applied statistician will find numerous instances of examples which pertain to a first passage time situation. It is indeed remarkable that in the fields of life testing, ecology,

entomology, health sciences, traffic intensity and management science the inverse Gaussian law plays a dominant role. Real life examples from actuarial science and ecology came to my attention after this project was completed and I found it impossible to include them.

The Inverse Gaussian Distribution

This book will be of interest to mathematical statisticians and biometricians interested in block designs. The emphasis of the book is on the randomization approach to block designs. After presenting the general theory of analysis based on the randomization model in Part I, the constructional and combinatorial properties of design are described in Part II. The book includes many new or recently published materials.

Block Designs: A Randomization Approach

The present lecture notes describe stochastic epidemic models and methods for their statistical analysis. Our aim is to present ideas for such models, and methods for their analysis; along the way we make practical use of several probabilistic and statistical techniques. This will be done without focusing on any specific disease, and instead rigorously analyzing rather simple models. The reader of these lecture notes could thus have a two-fold purpose in mind: to learn about epidemic models and their statistical analysis, and/or to learn and apply techniques in probability and statistics. The lecture notes require an early graduate level knowledge of probability and They introduce several techniques which might be new to students, but our statistics. intention is to present these keeping the technical level at a minlmum. Techniques that are explained and applied in the lecture notes are, for example: coupling, diffusion approximation, random graphs, likelihood theory for counting processes, martingales, the EM-algorithm and MCMC methods. The aim is to introduce and apply these techniques, thus hopefully motivating their further theoretical treatment. A few sections, mainly in Chapter 5, assume some knowledge of weak convergence; we hope that readers not familiar with this theory can understand the these parts at a heuristic level. The text is divided into two distinct but related parts: modelling and estimation.

Stochastic Epidemic Models and Their Statistical Analysis

This book focuses on Erdélyi–Kober fractional calculus from a statistical perspective inspired by solar neutrino physics. Results of diffusion entropy analysis and standard deviation analysis of data from the Super-Kamiokande solar neutrino experiment lead to the development of anomalous diffusion and reaction in terms of fractional calculus. The new statistical perspective of Erdélyi–Kober fractional operators outlined in this book will have fundamental applications in the theory of anomalous reaction and diffusion processes dealt with in physics. A major mathematical objective of this book is specifically to examine a new definition for fractional integrals in terms of the distributions of products and ratios of statistically independently distributed positive scalar random variables or in terms of Mellin convolutions of products and ratios in the case of real scalar variables. The idea will be generalized to cover multivariable cases as well as matrix variable cases. In the matrix variable case, M-convolutions of products and ratios will be used to extend the ideas. We then give a definition for the case of real-valued scalar functions of several matrices.

Erdélyi–Kober Fractional Calculus

Two of the most exciting topics of current research in stochastic networks are the complementary subjects of stability and rare events - roughly, the former deals with the typical behavior of networks, and the latter with significant atypical behavior. Both are classical topics, of interest since the early days of queueing theory, that have experienced renewed interest mo tivated by new applications to emerging technologies. For example, new stability issues arise in the scheduling of multiple job classes in semiconduc tor manufacturing, the so-called "re-entrant lines;" and a prominent need for studying rare events is associated with the design of telecommunication systems using the new ATM (asynchronous transfer mode) technology so as to guarantee quality of service. The objective of this volume is hence to present a sample - by no means comprehensive - of recent research problems, methodologies, and results in these two exciting and burgeoning areas. The volume is organized in two parts, with the first part focusing on stability, and the second part on rare events. But it is impossible to draw sharp boundaries in a healthy field, and inevitably some articles touch on both issues and several develop links with other areas as well. Part I is concerned with the issue of stability in queueing networks.

Stochastic Networks

The papers in this volume discuss important methodological advances in several important areas, including multivariate failure time data and interval censored data. The book will be an indispensable reference for researchers and practitioners in biostatistics, medical research, and the health sciences.

Proceedings of the First Seattle Symposium in Biostatistics: Survival Analysis

Senior probabilists from around the world with widely differing specialities gave their visions of the state of their specialty, why they think it is important, and how they think it will develop in the new millenium. The volume includes papers given at a symposium at Columbia University in 1995, but papers from others not at the meeting were added to broaden the coverage of areas. All papers were refereed.

Probability Towards 2000

Robust Bayesian analysis aims at overcoming the traditional objection to Bayesian analysis of its dependence on subjective inputs, mainly the prior and the loss. Its purpose is the determination of the impact of the inputs to a Bayesian analysis (the prior, the loss and the model) on its output when the inputs range in certain classes. If the impact is considerable, there is sensitivity and we should attempt to further refine the information the incumbent classes available, perhaps through additional constraints on and/ or obtaining additional data; if the impact is not important, robustness holds and no further analysis and refinement would be required. Robust Bayesian analysis has been widely accepted by Bayesian statisticians; for a while it was even a main research topic in the field. However, to a great extent, their impact is yet to be seen in applied settings. This volume, therefore, presents an overview of the current state of robust Bayesian methods and their applications and identifies topics of further in terest in the area. The papers in the volume are divided into nine parts covering the main aspects of the field. The first one provides an overview of Bayesian robustness at a non-technical level. The paper in Part II con cerns foundational aspects and describes decision-theoretical axiomatisa tions leading to the robust Bayesian paradigm, motivating reasons for which robust analysis is practically unavoidable within Bayesian analysis.

Robust Bayesian Analysis

This book is devoted to the theory and applications of nonparametic functional estimation and prediction. Chapter 1 provides an overview of inequalities and limit theorems for strong mixing processes. Density and regression estimation in discrete time are studied in Chapter 2 and 3. The special rates of convergence which appear in continuous time are presented in Chapters 4 and 5. This second edition is extensively revised and it contains two new chapters. Chapter 6 discusses the surprising local time density estimator. Chapter 7 gives a detailed account of implementation of nonparametric method and practical examples in economics, finance and physics. Comarison with ARMA and ARCH methods shows the efficiency of nonparametric forecasting. The prerequisite is a knowledge of classical probability theory and statistics. Denis Bosq is Professor of Statistics at the Unviersity of Paris 6 (Pierre et Marie Curie). He is Editor-in-Chief of "Statistical Inference for Stochastic Processes" and an editor of

"Journal of Nonparametric Statistics". He is an elected member of the International Statistical Institute. He has published about 90 papers or works in nonparametric statistics and four books.

Nonparametric Statistics for Stochastic Processes

In the area of multivariate analysis, there are two broad themes that have emerged over time. The analysis typically involves exploring the variations in a set of interrelated variables or investigating the simultaneous relation ships between two or more sets of variables. In either case, the themes involve explicit modeling of the relationships or dimension-reduction of the sets of variables. The multivariate regression methodology and its variants are the preferred tools for the parametric modeling and descriptive tools such as principal components or canonical correlations are the tools used for addressing the dimension-reduction issues. Both act as complementary to each other and data analysts typically want to make use of these tools for a thorough analysis of multivariate data. A technique that combines the two broad themes in a natural fashion is the method of reduced-rank regres sion. This method starts with the classical multivariate regression model framework but recognizes the possibility for the reduction in the number of parameters through a restrietion on the rank of the regression coefficient matrix. This feature is attractive because regression methods, whether they are in the context of a single response variable or in the context of several response variables, are popular statistical tools. The technique of reduced rank regression and its encompassing features are the primary focus of this book. The book develops the method of reduced-rank regression starting from the classical multivariate linear regression model.

Multivariate Reduced-Rank Regression

The main subject of this book is the estimation and forecasting of continuous time processes. It leads to a development of the theory of linear processes in function spaces. Mathematical tools are presented, as well as autoregressive processes in Hilbert and Banach spaces and general linear processes and statistical prediction. Implementation and numerical applications are also covered. The book assumes knowledge of classical probability theory and statistics.

Linear Processes in Function Spaces

Despite its short history, wavelet theory has found applications in a remarkable diversity of disciplines: mathematics, physics, numerical analysis, signal processing, probability theory and statistics. The abundance of intriguing and useful features enjoyed by wavelet and wavelet packed transforms has led to their application to a wide range of statistical and signal processing problems. On November 16-18, 1994, a conference on Wavelets and Statistics was held at Villard de Lans, France, organized by the Institute IMAG-LMC, Grenoble, France. The meeting was the 15th in the series of the Rencontres Pranco-Belges des 8tatisticiens and was attended by 74 mathematicians from 12 different countries. Following tradition, both theoretical statistical results and practical contributions of this active field of statistical research were presented. The editors and the local organizers hope that this volume reflects the broad spectrum of the conference. as it includes 21 articles contributed by specialists in various areas in this field. The material compiled is fairly wide in scope and ranges from the development of new tools for non parametric curve estimation to applied problems, such as detection of transients in signal processing and image segmentation. The articles are arranged in alphabetical order by author rather than subject matter. However, to help the reader, a subjective classification of the articles is provided at the end of the book. Several articles of this volume are directly or indirectly concerned with several as pects of wavelet-based function estimation and signal denoising.

Wavelets and Statistics

The volume presents contributions to the analysis of data in the information age - a challenge of growing importance. Scientists and professionals interested in classification, data analysis, and statistics will find in this book latest research results as well as applications to economics (especially finance and marketing), archeology, bioinformatics, environment, and health.

Classification in the Information Age

A comprehensive treatment of linear mixed models, focusing on examples from designed experiments and longitudinal studies. Aimed at applied statisticians and biomedical researchers in industry, public health organisations, contract research organisations, and academia, this book is explanatory rather

than mathematical rigorous. Although most analyses were done with the MIXED procedure of the SAS software package, and many of its features are clearly elucidated, considerable effort was put into presenting the data analyses in a software-independent fashion.

Linear Mixed Models in Practice

This monograph proposes several approaches to convergence monitoring for MCMC algorithms which are centered on the theme of discrete Markov chains. After a short introduction to MCMC methods, including recent developments like perfect simulation and Langevin Metropolis-Hastings algorithms, and to the current convergence diagnostics, the contributors present the theoretical basis for a study of MCMC convergence using discrete Markov chains and their specificities. The contributors stress in particular that this study applies in a wide generality, starting with latent variable models like mixtures, then extending the scope to chains with renewal properties, and concluding with a general Markov chain. They then relate the different connections with discrete or finite Markov chains with practical convergence diagnostics which are either graphical plots (allocation map, divergence graph, variance stabilizing, normality plot), stopping rules (normality, stationarity, stability tests), or confidence bounds (divergence, asymptotic variance, normality). Most of the quantitative tools take advantage of manageable versions of the CLT. The different methods proposed here are first evaluated on a set of benchmark examples and then studied on three full scale realistic applications, along with the standard convergence diagnostics: A hidden Markov modelling of DNA sequences, including a perfect simulation implementation, a latent stage modelling of the dynamics of HIV infection, and a modelling of hospitalization duration by exponential mixtures. The monograph is the outcome of a monthly research seminar held at CREST, Paris, since 1995. The seminar involved the contributors to this monograph and was led by Christian P. Robert, Head of the Satistics Laboratory at CREST and Professor of Statistics at the University of Rouen since 1992.

Discretization and MCMC Convergence Assessment

Monte Carlo methods are numerical methods based on random sampling and quasi-Monte Carlo methods are their deterministic versions. This volume contains the refereed proceedings of the Second International Conference on Monte Carlo and Quasi-Monte Carlo Methods in Scientific Computing which was held at the University of Salzburg (Austria) from July 9--12, 1996. The conference was a forum for recent progress in the theory and the applications of these methods. The topics covered in this volume range from theoretical issues in Monte Carlo and simulation methods, low-discrepancy point sets and sequences, lattice rules, and pseudorandom number generation to applications such as numerical integration, numerical linear algebra, integral equations, binary search, global optimization, computational physics, mathematical finance, and computer graphics. These proceedings will be of interest to graduate students and researchers in Monte Carlo and quasi-Monte Carlo methods, to numerical analysts, and to practitioners of simulation methods.

Monte Carlo and Quasi-Monte Carlo Methods 1996

Here, the authors explain the basic ideas so as to generate interest in modern problems of experimental design. The topics discussed include designs for inference based on nonlinear models, designs for models with random parameters and stochastic processes, designs for model discrimination and incorrectly specified (contaminated) models, as well as examples of designs in functional spaces. Since the authors avoid technical details, the book assumes only a moderate background in calculus, matrix algebra, and statistics. However, at many places, hints are given as to how readers may enhance and adopt the basic ideas for advanced problems or applications. This allows the book to be used for courses at different levels, as well as serving as a useful reference for graduate students and researchers in statistics and engineering.

Model-Oriented Design of Experiments

Affine Hecke Algebras And Orthogonal Polynomials

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addition and multiplication, the set of polynomials with their addition and multiplication, the coordinate ring of an affine algebraic variety, and the ring... 99 KB (13,383 words) - 08:14, 22 March 2024
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