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### Matrix Tricks for Linear Statistical Models

John Wiley & Sons

"Over the years, I have had the opportunity to teach several regression courses, and I cannot think of a better undergraduate text than this one." —The American Statistician "The book is well written and has many exercises. It can serve as a very good textbook for scientists and engineers, with only basic statistics as a prerequisite. I also highly recommend it to practitioners who want to solve real-life prediction problems." (Computing Reviews) Modern Regression Methods, Second Edition maintains the accessible organization, breadth of coverage, and cutting-edge appeal that

earned its predecessor the title of being one of the top five books for statisticians by an Amstat News book editor in 2003. This new edition has been updated and enhanced to include all-new information on the latest advances and research in the evolving field of regression analysis. The book provides a unique treatment of fundamental regression methods, such as diagnostics, transformations, robust regression, and ridge regression. Unifying key concepts and procedures, this new edition emphasizes applications to provide a more hands-on and comprehensive understanding of regression diagnostics. New features of the Second Edition include: A revised chapter on logistic regression, including improved methods of parameter estimation A new chapter focusing on additional topics of study in regression, including quantile regression,

semiparametric regression, and Poisson regression A wealth of new and updated exercises with worked solutions An extensive FTP site complete with Minitab macros, which allow the reader to compute analyses, and specialized procedures Updated references at the end of each chapter that direct the reader to the appropriate resources for further study An accessible guide to state-of-the-art regression techniques, Modern Regression Methods, Second Edition is an excellent book for courses in regression analysis at the upper-undergraduate and graduate levels. It is also a valuable reference for practicing statisticians, engineers, and physical scientists.

### **Statistical Tests for Mixed Linear Models**

John Wiley & Sons

The Wiley Classics Library 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. Spatial statistics — analyzing spatial data through statistical models — has proven exceptionally versatile, encompassing problems ranging from the microscopic to the astronomic. However, for the scientist and engineer faced only with scattered and uneven treatments of the subject in the scientific literature, learning how to make practical use of spatial statistics in day-to-day analytical work is very difficult. Designed exclusively for scientists eager to tap into the enormous potential of this analytical tool and upgrade their range of technical skills, *Statistics for Spatial Data* is a comprehensive, single-source guide to both the theory and applied aspects of spatial statistical methods. The hard-cover edition was hailed by *Mathematical Reviews* as an "excellent book which will become a basic reference." This paperback edition of the 1993 edition, is designed to meet the many technological challenges facing the scientist and engineer. Concentrating on the three areas of geostatistical data, lattice data, and point patterns, the book sheds light on the link between data and model, revealing how design, inference, and diagnostics are an outgrowth of that link. It then explores new methods to reveal just how spatial statistical models can be used to solve important problems in a host of areas in science and engineering. Discussion includes: Exploratory spatial data analysis Spectral theory for stationary processes Spatial scale Simulation methods for spatial processes Spatial bootstrapping Statistical image analysis and remote sensing Computational aspects of model fitting Application of models to disease mapping Designed to accommodate the practical needs of the professional, it features a unified and common notation for its subject as well as many detailed examples woven into the text, numerous illustrations (including graphs that illuminate the theory discussed) and over 1,000 references. Fully balancing theory with applications, *Statistics for Spatial Data, Revised Edition* is an exceptionally clear guide on making optimal use of one of the ascendant analytical tools of the decade, one that has begun to capture the imagination of professionals in biology, earth science, civil, electrical, and agricultural engineering, geography,

epidemiology, and ecology.

**A User's Guide to Principal Components**  
Wiley-Interscience

A valuable new edition of a standard reference The use of statistical methods for categorical data has increased dramatically, particularly for applications in the biomedical and social sciences. An Introduction to Categorical Data Analysis, Third Edition summarizes these methods and shows readers how to use them using software. Readers will find a unified generalized linear models approach that connects logistic regression and loglinear models for discrete data with normal regression for continuous data. Adding to the value in the new edition is:

- Illustrations of the use of R software to perform all the analyses in the book
- A new chapter on alternative methods for categorical data, including smoothing and regularization methods (such as the lasso), classification methods such as linear discriminant analysis and classification trees, and cluster analysis
- New sections in many chapters introducing the Bayesian approach for the methods of that chapter
- More than 70 analyses of data sets to illustrate application of the methods, and about 200 exercises, many containing other data sets
- An appendix showing how to use SAS, Stata, and SPSS, and an appendix with short solutions to most odd-numbered exercises

Written in an applied, nontechnical style, this book illustrates the methods using a wide variety of real data, including medical clinical trials, environmental questions, drug use by teenagers, horseshoe crab mating, basketball shooting, correlates of happiness, and much more. An Introduction to Categorical Data Analysis, Third Edition is an invaluable tool for statisticians and biostatisticians as well as methodologists in the social and behavioral sciences, medicine and public health, marketing, education, and the biological and agricultural sciences.

**Prior Information in Linear Models**

John Wiley & Sons

An accessible and self-contained introduction to statistical models—now in a modernized new edition *Generalized, Linear, and Mixed Models, Second Edition* provides an up-to-date treatment of the essential techniques for developing and applying a wide variety of statistical models. The book presents thorough and unified coverage of the theory behind generalized, linear, and mixed models and highlights their similarities and differences in various construction, application, and computational aspects. A clear introduction to the basic ideas of fixed effects models, random effects

models, and mixed models is maintained throughout, and each chapter illustrates how these models are applicable in a wide array of contexts. In addition, a discussion of general methods for the analysis of such models is presented with an emphasis on the method of maximum likelihood for the estimation of parameters. The authors also provide comprehensive coverage of the latest statistical models for correlated, non-normally distributed data. Thoroughly updated to reflect the latest developments in the field, the Second Edition features: A new chapter that covers omitted covariates, incorrect random effects distribution, correlation of covariates and random effects, and robust variance estimation A new chapter that treats shared random effects models, latent class models, and properties of models A revised chapter on longitudinal data, which now includes a discussion of generalized linear models, modern advances in longitudinal data analysis, and the use between and within covariate decompositions Expanded coverage of marginal versus conditional models Numerous new and updated examples With its accessible style and wealth of illustrative exercises, *Generalized, Linear, and Mixed Models, Second Edition* is an ideal book for courses on generalized linear and mixed models at the upper-undergraduate and beginning-graduate levels. It also serves as a valuable reference for applied statisticians, industrial practitioners, and researchers.

**Applied Regression Analysis** John Wiley & Sons

Presents a systematic account of the theory of rank order statistics as applied to the problems of general linear models. Offers a unified approach to general multivariate linear models with an emphasis on nonparametrics. Includes an extensive, up-to-date bibliography.

**Linear Models and Design** John Wiley & Sons

A concise summary of the statistical methods used in the analysis of survival data with censoring. Emphasizes recently developed nonparametric techniques. Outlines methods in detail and illustrates them with actual data. Discusses the theory behind each method. Includes numerous worked problems and numerical exercises.

**Applied Linear Regression** Wiley-Interscience

Master linear regression techniques with a new edition of a classic text *Reviews of the Second Edition*: "I found it enjoyable reading and so full of interesting material that even the well-informed reader will

probably find something new . . . a necessity for all of those who do linear regression." —Technometrics, February 1987 "Overall, I feel that the book is a valuable addition to the now considerable list of texts on applied linear regression. It should be a strong contender as the leading text for a first serious course in regression analysis." —American Scientist, May–June 1987 Applied Linear Regression, Third Edition has been thoroughly updated to help students master the theory and applications of linear regression modeling. Focusing on model building, assessing fit and reliability, and drawing conclusions, the text demonstrates how to develop estimation, confidence, and testing procedures primarily through the use of least squares regression. To facilitate quick learning, the Third Edition stresses the use of graphical methods in an effort to find appropriate models and to better understand them. In that spirit, most analyses and homework problems use graphs for the discovery of structure as well as for the summarization of results. The Third Edition incorporates new material reflecting the latest advances, including: Use of smoothers to summarize a scatterplot Box-Cox and graphical methods for selecting transformations Use of the delta method for inference about complex combinations of parameters Computationally intensive methods and simulation, including the bootstrap method Expanded chapters on nonlinear and logistic regression Completely revised chapters on multiple regression, diagnostics, and generalizations of regression Readers will also find helpful pedagogical tools and learning aids, including: More than 100 exercises, most based on interesting real-world data Web primers demonstrating how to use standard statistical packages, including R, S-Plus®, SPSS®, SAS®, and JMP®, to work all the examples and exercises in the text A free online library for R and S-Plus that makes the methods discussed in the book easy to use With its focus on graphical methods and analysis, coupled with many practical examples and exercises, this is an excellent textbook for upper-level undergraduates and graduate students, who will quickly learn how to use linear regression analysis techniques to solve and gain insight into real-life problems.

**Linear Models in Statistics** John Wiley & Sons

A rigorous, self-contained examination of mixed model theory and application Mixed modeling is one of the most promising and exciting areas of statistical analysis, enabling the analysis of nontraditional,

clustered data that may come in the form of shapes or images. This book provides in-depth mathematical coverage of mixed models' statistical properties and numerical algorithms, as well as applications such as the analysis of tumor regrowth, shape, and image. Paying special attention to algorithms and their implementations, the book discusses: Modeling of complex clustered or longitudinal data Modeling data with multiple sources of variation Modeling biological variety and heterogeneity Mixed model as a compromise between the frequentist and Bayesian approaches Mixed model for the penalized log-likelihood Healthy Akaike Information Criterion (HAIC) How to cope with parameter multidimensionality How to solve ill-posed problems including image reconstruction problems Modeling of ensemble shapes and images Statistics of image processing Major results and points of discussion at the end of each chapter along with "Summary Points" sections make this reference not only comprehensive but also highly accessible for professionals and students alike in a broad range of fields such as cancer research, computer science, engineering, and industry.

**The R Book** John Wiley & Sons

This edited volume provides both conceptual and practical information for conducting and evaluating evidence-based outcome studies. It encompasses psychotherapy research for traditional mental health disorders (eg. depression, anxiety), as well as psychosocial-based treatments provided to medical patient populations to have impact either on the disease process itself (pain, cardiovascular risk) or to improve the quality of life of such individuals. This is a hands-on book, whose major emphasis is on the practical nuts-and-bolts implementation of psychosocial-based RCTs from conception to completion.

**Robust Statistics** Springer Nature

An incomparably useful examination of statistical methods for comparison The nature of doing science, be it natural or social, inevitably calls for comparison. Statistical methods are at the heart of such comparison, for they not only help us gain understanding of the world around us but often define how our research is to be carried out. The need to compare between groups is best exemplified by experiments, which have clearly defined statistical methods. However, true experiments are not always possible. What complicates the matter more is a great deal of diversity in factors that are not independent of the outcome. Statistical

Group Comparison brings together a broad range of statistical methods for comparison developed over recent years. The book covers a wide spectrum of topics from the simplest comparison of two means or rates to more recently developed statistics including double generalized linear models and Bayesian as well as hierarchical methods. Coverage includes: \* Testing parameter equality in linear regression and other generalized linear models (GLMs), in order of increasing complexity \* Likelihood ratio, Wald, and Lagrange multiplier statistics examined where applicable \* Group comparisons involving latent variables in structural equation modeling \* Models of comparison for categorical latent variables Examples are drawn from the social, political, economic, and biomedical sciences; many can be implemented using widely available software. Because of the range and the generality of the statistical methods covered, researchers across many disciplines-beyond the social, political, economic, and biomedical sciences-will find the book a convenient reference for many a research situation where comparisons may come naturally. **Evidence-Based Outcome Research** John Wiley & Sons

Basic operations. Special matrices. Determinants. Inverse matrices. Rank. Canonical forms. Generalized inverses. Solving linear equations. Partitioned matrices. Eigenvalues and eigenvectors. Applications in statistics. The matrix algebra of regression analysis. An introduction to linear statistical model.

**Design and Analysis of Clinical Experiments** John Wiley & Sons

The development of statistical theory in the past fifty years is faithfully reflected in the history of the late Sir Maurice Kendall's volumes The Advanced Theory of Statistics. The Advanced Theory began life as a two volume work (Volume 1, 1943; Volume 2, 1946) and grew steadily, as a single authored work until the late fifties. At that point Alan Stuart became involved and the Advanced Theory was rewritten in three volumes. When Keith Ord joined in the early eighties, Volume 3 became the largest and plans were developed to expand it into a series of monographs called the Kendall's Library of Statistics which would devote a book to each of the modern developments in statistics. This series is well on the way with 5 titles in print and a further 7 on the way. A new volume on Bayesian Inference was also commissioned from Tony O'Hagan and published in 1994 as Volume 2B of the Advanced Theory. This Volume 2A is therefore the completely updated Volume



2 - Classical Inference and Relationship. A new author, Steven Arnold, was invited to join Keith Ord and they have between them produced a work of the highest quality. References have been updated and material revised throughout. A new chapter on the linear model and least squares estimation has been added.

**Kendall's Advanced Theory of Statistics, Classical Inference and the Linear Model** Wiley

Robust statistics is an extension of classical statistics that specifically takes into account the concept that the underlying models used to describe data are only approximate. Its basic philosophy is to produce statistical procedures which are stable when the data do not exactly match the postulated models as it is the case for example with outliers. Robust Methods in Biostatistics proposes robust alternatives to common methods used in statistics in general and in biostatistics in particular and illustrates their use on many biomedical datasets. The methods introduced include robust estimation, testing, model selection, model check and diagnostics. They are developed for the following general classes of models: Linear regression Generalized linear models Linear mixed models Marginal longitudinal data models Cox survival analysis model The methods are introduced both at a theoretical and applied level within the framework of each general class of models, with a particular emphasis put on practical data analysis. This book is of particular use for research students, applied statisticians and practitioners in the health field interested in more stable statistical techniques. An accompanying website provides R code for computing all of the methods described, as well as for analyzing all the datasets used in the book.

**Survival Analysis** John Wiley & Sons

A comprehensive, must-have handbook of matrix methods with a unique emphasis on statistical applications This timely book, A Matrix Handbook for Statisticians, provides a comprehensive, encyclopedic treatment of matrices as they relate to both statistical concepts and methodologies. Written by an experienced authority on matrices and statistical theory, this handbook is organized by topic rather than mathematical developments and includes numerous references to both the theory behind the methods and the applications of the methods. A uniform approach is applied to each chapter, which contains four parts: a definition followed by a list of results; a short list of references to related topics in the book; one or more references to

proofs; and references to applications. The use of extensive cross-referencing to topics within the book and external referencing to proofs allows for definitions to be located easily as well as interrelationships among subject areas to be recognized. A Matrix Handbook for Statisticians addresses the need for matrix theory topics to be presented together in one book and features a collection of topics not found elsewhere under one cover. These topics include: Complex matrices A wide range of special matrices and their properties Special products and operators, such as the Kronecker product Partitioned and patterned matrices Matrix analysis and approximation Matrix optimization Majorization Random vectors and matrices Inequalities, such as probabilistic inequalities Additional topics, such as rank, eigenvalues, determinants, norms, generalized inverses, linear and quadratic equations, differentiation, and Jacobians, are also included. The book assumes a fundamental knowledge of vectors and matrices, maintains a reasonable level of abstraction when appropriate, and provides a comprehensive compendium of linear algebra results with use or potential use in statistics. A Matrix Handbook for Statisticians is an essential, one-of-a-kind book for graduate-level courses in advanced statistical studies including linear and nonlinear models, multivariate analysis, and statistical computing. It also serves as an excellent self-study guide for statistical researchers.

**Alternative Methods of Regression**

John Wiley & Sons

A valuable overview of the most important ideas and results in statistical modeling Written by a highly-experienced author, Foundations of Linear and Generalized Linear Models is a clear and comprehensive guide to the key concepts and results of linear statistical models. The book presents a broad, in-depth overview of the most commonly used statistical models by discussing the theory underlying the models, R software applications, and examples with crafted models to elucidate key ideas and promote practical modelbuilding. The book begins by illustrating the fundamentals of linear models, such as how the model-fitting projects the data onto a model vector subspace and how orthogonal decompositions of the data yield information about the effects of explanatory variables. Subsequently, the book covers the most popular generalized linear models, which include binomial and multinomial logistic regression for categorical data, and Poisson and negative

binomial loglinear models for count data. Focusing on the theoretical underpinnings of these models, Foundations of Linear and Generalized Linear Models also features: An introduction to quasi-likelihood methods that require weaker distributional assumptions, such as generalized estimating equation methods An overview of linear mixed models and generalized linear mixed models with random effects for clustered correlated data, Bayesian modeling, and extensions to handle problematic cases such as high dimensional problems Numerous examples that use R software for all text data analyses More than 400 exercises for readers to practice and extend the theory, methods, and data analysis A supplementary website with datasets for the examples and exercises An invaluable textbook for upper-undergraduate and graduate-level students in statistics and biostatistics courses, Foundations of Linear and Generalized Linear Models is also an excellent reference for practicing statisticians and biostatisticians, as well as anyone who is interested in learning about the most important statistical models for analyzing data.

**Handbook of Linear Algebra** John Wiley & Sons

From the reviews of the First Edition. "An interesting, useful, and well-written book on logistic regression models . . . Hosmer and Lemeshow have used very little mathematics, have presented difficult concepts heuristically and through illustrative examples, and have included references." —Choice "Well written, clearly organized, and comprehensive . . . the authors carefully walk the reader through the estimation of interpretation of coefficients from a wide variety of logistic regression models . . . their careful explication of the quantitative re-expression of coefficients from these various models is excellent."

—Contemporary Sociology "An extremely well-written book that will certainly prove an invaluable acquisition to the practicing statistician who finds other literature on analysis of discrete data hard to follow or heavily theoretical." —The Statistician In this revised and updated edition of their popular book, David Hosmer and Stanley Lemeshow continue to provide an amazingly accessible introduction to the logistic regression model while incorporating advances of the last decade, including a variety of software packages for the analysis of data sets. Hosmer and Lemeshow extend the discussion from biostatistics and epidemiology to cutting-edge applications in data mining and machine learning, guiding readers step-by-

step through the use of modeling techniques for dichotomous data in diverse fields. Ample new topics and expanded discussions of existing material are accompanied by a wealth of real-world examples-with extensive data sets available over the Internet.

*Matrix Algebra Useful for Statistics* CRC Press

An advanced discussion of linear models with mixed or random effects. In recent years a breakthrough has occurred in our ability to draw inferences from exact and optimum tests of variance component models, generating much research activity that relies on linear models with mixed and random effects. This volume covers the most important research of the past decade as well as the latest developments in hypothesis testing. It compiles all currently available results in the area of exact and optimum tests for variance component models and offers the only comprehensive treatment for these models at an advanced level. *Statistical Tests for Mixed Linear Models: Combines analysis and testing in one self-contained volume.* Describes analysis of variance (ANOVA) procedures in balanced and unbalanced data situations. Examines methods for determining the effect of imbalance on data analysis. Explains exact and optimum tests and methods for their derivation. Summarizes test procedures for multivariate mixed and random models. Enables novice readers to skip the derivations and discussions on optimum tests. Offers plentiful examples and exercises, many of which are numerical in flavor. Provides solutions to selected exercises. *Statistical Tests for Mixed Linear Models* is an accessible reference for researchers in analysis of variance, experimental design, variance component

analysis, and linear mixed models. It is also an important text for graduate students interested in mixed models.

*Robust Methods in Biostatistics* John Wiley & Sons

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. From the Reviews of *A User's Guide to Principal Components* "The book is aptly and correctly named—*A User's Guide*. It is the kind of book that a user at any level, novice or skilled practitioner, would want to have at hand for autotutorial, for refresher, or as a general-purpose guide through the maze of modern PCA." —*Technometrics* "I recommend *A User's Guide to Principal Components* to anyone who is running multivariate analyses, or who contemplates performing such analyses. Those who write their own software will find the book helpful in designing better programs. Those who use off-the-shelf software will find it invaluable in interpreting the results." —*Mathematical Geology*

*Applied Logistic Regression* John Wiley & Sons

This book is designed as a textbook for graduate students and as a resource for researchers seeking a thorough mathematical treatment of its subject. It develops the main results of regression and the analysis of variance, as well as the central results on confounded and

fractional factorial experiments. Matrix theory is deemphasized; its role is taken instead by the theory of linear transformations between vector spaces. The text gives a carefully paced and unified presentation of two topics, linear models and experimental design. Students are assumed to have a solid background in linear algebra, basic knowledge of regression and analysis of variance, and some exposure to experimental design, and should be comfortable with reading and constructing mathematical proofs. The book leads students into the mathematical theory, including many examples both for motivation and for illustration. Over 130 exercises of varying difficulty are included. An extensive mathematical appendix and a detailed index make the text especially accessible. *Linear Models and Design* can serve as a textbook for a year-long course in the topics covered, or for a one-semester course in either linear model theory or experimental design. It prepares students for more advanced topics in the field, and assists in developing a thoughtful approach to the existing literature. It includes a guide to terminology as well as discussion of the history and development of ideas, and offers a fresh perspective on the fundamental concepts and results of the subject.

**Statistical Analysis with Missing Data**  
John Wiley & Sons

With a substantial amount of new material, the *Handbook of Linear Algebra, Second Edition* provides comprehensive coverage of linear algebra concepts, applications, and computational software packages in an easy-to-use format. It guides you from the very elementary aspects of the subject to the frontiers of current research. Along with revisions and