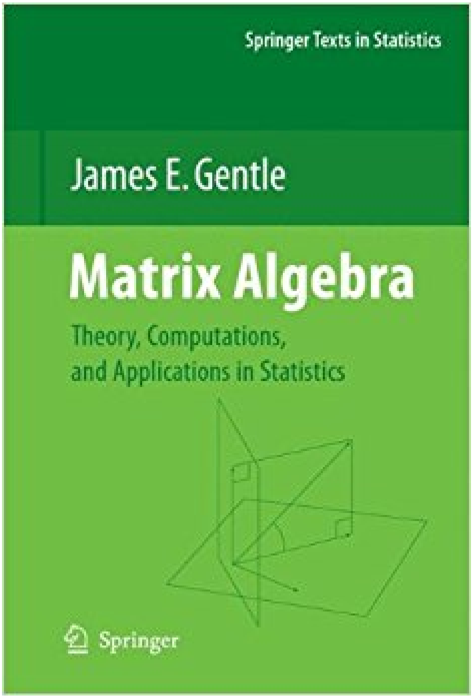
Matrix Algebra: Theory, Computations, And Applications In Statistics (Springer Texts In Statistics)



Synopsis

Matrix algebra is one of the most important areas of mathematics for data analysis and for statistical theory. This much-needed work presents the relevant aspects of the theory of matrix algebra for applications in statistics. It moves on to consider the various types of matrices encountered in statistics, such as projection matrices and positive definite matrices, and describes the special properties of those matrices. Finally, it covers numerical linear algebra, beginning with a discussion of the basics of numerical computations, and following up with accurate and efficient algorithms for factoring matrices, solving linear systems of equations, and extracting eigenvalues and eigenvectors.

Book Information

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Customer Reviews

From the reviews: "[T]his well-written book on matrix algebra reminds me of many classics in the field. It is both concise and timely, and provides a good collection of overviews and reviews of important tools used in statistical methods. The book seems best suited as a supplementary text for various courses in multivariate statistical analysis or linear models. I also can safely recommend this book as a handy resource manual for researchers as well as practitioners." (Technometrics, May 2008, Vol. 50, No. 2) "Readership: Students of a course in matrix algebra for statistics, or in statistical computing. â | Recently, quite a number of books on matrices related to statistics have been published â | . computational orientation of this book is probably the main difference between it and these other books. â | I never thought that one could write a matrix book with statistical applications without having C.R. Rao in the references; here the book now is. â | an extensive, personal, and easy-to-read matrix book of high quality. Recommended." (Simo Puntanen, International Statistical Review, Vol. 75 (3), 2007) "This book is a remarkable and in a way unusual approach to integrate the two mega fields by a kind of interrelated guide. â | Remarkably the referencing is done by pages â | and the pages are precisely on target, which is proof of the careful writing and editing. â | The book is a careful and interesting exposition of almost encyclopedic coverage of the interrelatedness of matrices and computation, emphasizing also statistical applications. â | a strong, highly recommendable guide to the intricacies of matrices in statistics." (GÃ¶tz Uebe, Advances in Statistical Analysis, Vol. 92 (3), 2008) "This is a very refreshing book covering matrix theory and its applications in statistics and numerical analysis. It has the character of a handbook and is lucidly written. â | A 14 page bibliography that is sufficient to trace the omitted proof details rounds out this book into almost a handbook of current state of the art knowledge in matrix theory and applications. There are eleven sets of exercises and detailed hints and partial solutions also." (Frank Uhlig, Zentralblatt MATH, Vol. 1133 (11), 2008) "This book could serve as a text for a course in matrices for statistics â | or, more generally, a course in statistical computing or linear models. â | this can be a useful reference book for such a course or, more generally, as a reference for any statistician who uses matrix algebra extensively. â | Overall, I really enjoyed reading Matrix Algebra: Theory, Computations, and Applications in Statistics, and I would recommend it as a nice reference to anyone interested in linear models, particularly its numerical aspects." (Abhyuday Mandal, Journal of the American Statistical Association, Vol. 103 (484), December, 2008)

Matrix algebra is one of the most important areas of mathematics for data analysis and for statistical theory. The first part of this book presents the relevant aspects of the theory of matrix algebra for applications in statistics. This part begins with the fundamental concepts of vectors and vector spaces, next covers the basic algebraic properties of matrices, then describes the analytic properties of vectors and matrices in the multivariate calculus, and finally discusses operations on matrices in solutions of linear systems and in eigenanalysis. This part is essentially self-contained. The second part of the book begins with a consideration of various types of matrices encountered in statistics, such as projection matrices and positive definite matrices, and describes the special properties of those matrices. The second part also describes some of the many applications of matrix theory in statistics, including linear models, multivariate analysis, and stochastic processes. The brief coverage in this part illustrates the matrix theory developed in the first part of the book.

The first two parts of the book can be used as the text for a course in matrix algebra for statistics students, or as a supplementary text for various courses in linear models or multivariate statistics. The third part of this book covers numerical linear algebra. It begins with a discussion of the basics of numerical computations, and then describes accurate and efficient algorithms for factoring matrices, solving linear systems of equations, and extracting eigenvalues and eigenvectors. Although the book is not tied to any particular software system, it describes and gives examples of the use of modern computer software for numerical linear algebra. This part is essentially self-contained, although it assumes some ability to program in Fortran or C and/or the ability to use R/S-Plus or Matlab. This part of the book can be used as the text for a course in statistical computing, or as a supplementary text for various courses that emphasize computations. The book includes a large number of exercises with some solutions provided in an appendix. James E. Gentle is University Professor of Computational Statistics at George Mason University. He is a Fellow of the American Statistical Association (ASA) and of the American Association for the Advancement of Science. He has held several national offices in the ASA and has served as associate editor of journals of the ASA as well as for other journals in statistics and computing. He is author of Random Number Generation and Monte Carlo Methods, Second Edition, and Elements of Computational Statistics.

I think it’s one of the best books on the subject, all theorems with demonstration, a lot of examples and problems solved (I like specially the chapter about Generalized Inverse matrix)... ...written in Latex so it looks very "beautiful"...ALL what you wanted to know about matrix theory is in this book ... very rigourous, with modern notation for matrices and vectors, besides it covers almost all subjects related with the application of matrix theory (...for a statistician who works in multivariate analysis or linear models this book should be THE BIBLE...).Besides it is much modern than many of the good books in the subject (Gantmacher for example). I love this book

It deserves SIX stars. Very briefly:I came across several books of matrix algebra. This is probably the most comprehensive, captivating and informative.In case of doubts or needs of research about any issue on matrix algebra and methods for analyzing/computing multivariate structures, this is the place to go.Nothing is missing.It is not structured with definitions, lemmas, theorems, corollaries. It explains and clearly *proves* every concept in a talkative manner, extremely formal yet. When things gets complicated, it always refers to the proper paragraph for helping the reader to connect the dots.Computational solutions are described in strict mathematical words (no pseudo code) step by step.Overall, this is a wonderful piece work.

I am not a real mathematician or hard core numeric analyst; my formal training is lacking, and maybe that's why I don't gravitate to Dennis Bernstein's text or others like it. I have managed to get past the very basics (rank, determinants, permanents, spectral decomposition, Jordon normal form) and come to appreciate the numeric issues involved in computing (or, more to the point, avoiding the computation of) inverses and pseudoinverses. The theory is less interesting to me than, or at least is primarily in service of, the applications. James Gentle's treatment of how numeric computing is actually done serves as useful context which I found missing in some more theoretical texts, and glossed over by some introductory texts. I guess that's why I keep coming back to it. It serves my personal needs. I find it surprisingly readable; diagrams are used as needed, and its index is good.Perhaps I am simply in a sort of limbo, where this intermediate (?) linear algebra text is something I might eventually outgrow. (When that might happen, I'm sure I don't know) Experienced numeric analysts seem to prefer treatments like Bernstein, Horn, or Golub & Van Loan, while the SIAM text by Meyer or the classic textbooks by Strang are probably better introductions. This book is clearly slanted towards statisticians, and more than that, statisticians who find themselves operating on large datasets, perhaps without a rigorous math background. It was invaluable to me when I had to implement my own GLM engine (for reasons too boring to discuss here, I couldn't use GPLed software). You don't really need it to peck at R, for example, but if you go to scale up a piece of code in C++ or similar, it will be much more difficult if you haven't digested this material. (I find Jorge Nocedal's "Numeric Optimization" to be an extremely useful companion to Gentle's book)It's cheaper (on , at least), and to my mind more coherent, than any of the other texts I have listed above. Our university library is superb, so I've checked out all of them, and I own Meyer's book. (It was very useful for me to get started and I wish I'd had it when I took p-chem) But now Gentle's book is the one on my desk (library sticker and all -- I still haven't bought it, though I've had it out on loan for something like 10 months now). I doubt that a physicist will learn anything new from it, but a CS student might. Gentle has a newer textbook out on Computational Statistics, so depending on your focus, that may be of equal or greater value to you. I can just read papers (or look for implementations) if I need specific solutions; this book helps me organize different methods by theme, and provides just enough rigor for me to maintain mathematical context.If you are in a similar situation, I think you'll find this book to be a valuable resource. I have.

Very well focused on statistics topics.

I had missing pages. Also, I had pages that are connected, so I had to split them by scissors. They refuse to return the book since, it’s been more than a month. But how can I check for blank pages in a big textbook.

Its okay , lots of words and not used for the class i got this for, a better book could have been picked

Matrix Algebra: Theory, Computations, and Applications in Statistics (Springer Texts in Statistics) Matrix Algebra (Springer Texts in Statistics) Matrix Algebra Useful for Statistics (Wiley Series in Probability and Statistics) Matrix Algebra & Its Applications to Statistics & Econometrics Matrix Computations and Semiseparable Matrices: Eigenvalue and Singular Value Methods (Volume 2) Matrix Computations and Semiseparable Matrices: Linear Systems (Volume 1) Matrix Computations (Johns Hopkins Studies in the Mathematical Sciences) Fundamentals of Matrix Computations Matrix Computations (Johns Hopkins Studies in Mathematical Sciences)(3rd Edition) Statistics and Data Analysis for Financial Engineering: with R examples (Springer Texts in Statistics) Statistics and Finance: An Introduction (Springer Texts in Statistics) Applied Bayesian Statistics: With R and OpenBUGS Examples (Springer Texts in Statistics) All of Statistics: A Concise Course in Statistical Inference (Springer Texts in Statistics) Time Series Analysis and Its Applications: With R Examples (Springer Texts in Statistics) Time Series Analysis: With Applications in R (Springer Texts in Statistics) An Introduction to Statistical Learning: with Applications in R (Springer Texts in Statistics) Plane Answers to Complex Questions: The Theory of Linear Models (Springer Texts in Statistics) Statistics for People Who (Think They) Hate Statistics (Salkind, Statistics for People Who(Think They Hate Statistics(Without CD)) Programming for Computations - Python: A Gentle Introduction to Numerical Simulations with Python (Texts in Computational Science and Engineering) Hands-On Matrix Algebra Using R: Active and Motivated Learning with Applications