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JRUC09 - GREYSON KARTER

This textbook on statistical modeling and statistical inference will assist advanced undergraduate and graduate students. Statistical Modeling and Computation provides a unique introduction to modern Statistics from both classical and Bayesian perspectives. It also offers an integrated treatment of Mathematical Statistics and modern statistical computation, emphasizing statistical modeling, computational techniques, and applications. Each of the three parts will cover topics essential to university courses. Part I covers the fundamentals of probability theory. In Part II, the authors introduce a wide variety of classical models that include, among others, linear regression and ANOVA models. In Part III, the authors address the statistical analysis and computation of various advanced models, such as generalized linear, state-space and Gaussian models. Particular attention is paid to fast Monte Carlo techniques for Bayesian inference on these models. Throughout the book the authors include a large number of illustrative examples and solved problems. The book also features a section with solutions, an appendix that serves as a MATLAB primer, and a mathematical supplement.

Although there are many books on mathematical finance, few deal with the statistical aspects of modern data analysis as applied to financial problems. This textbook fills this gap by addressing some of the most challenging issues facing financial engineers. It shows how sophisticated mathematics and modern statistical techniques can be used in the solutions of concrete financial problems. Concerns of risk management are addressed by the study of extreme values, the fitting of distributions with heavy tails, the computation of values at risk (VaR), and other measures of risk. Principal component analysis (PCA), smoothing, and regression techniques are applied to the construction of yield and forward curves. Time series analysis is applied to the study of temperature options and nonparametric estimation. Nonlinear filtering is applied to Monte Carlo simulations, option pricing and earnings prediction. This textbook is intended for undergraduate students majoring in financial engineering, or graduate students in a Master in finance or MBA program. It is sprinkled with practical examples using market data, and each chapter ends with exercises. Practical examples are solved in the R computing environment. They illustrate problems occurring in the commodity, energy and weather markets, as well as the fixed income, equity and credit markets. The examples, experiments and problem sets are based on the library Rsaft developed for the purpose of the text. The book should help quantitative analysts learn and implement advanced statistical concepts. Also, it will be valuable for researchers wishing to gain experience with financial data, implement and test mathematical theories, and address practical issues that are often ignored or underestimated in academic curricula. This is the new, fully-revised edition to the book Statistical Analysis of Financial Data in S-Plus. René Carmona is the Paul M. Wythes '55 Professor of Engineering and Finance at Princeton University in the department of Operations Research and Financial Engineering, and Director of Graduate Studies of the Bendheim Center for Finance. His publications include over one hundred articles and eight books in probability and statistics. He was elected Fellow of the Institute of Mathematical Statistics in 1984, and of the Society for Industrial and Applied Mathematics in 2010. He is on the editorial board of several peer-reviewed journals and book series. Professor Carmona has developed computer programs for teaching statistics and research in signal analysis and financial engineering. He has worked for many years on energy, the commodity markets and more recently in environmental economics, and he is recognized as a leading researcher and expert in these areas.

This book provides an undergraduate introduction to analysing data for data science, computer science, and quantitative social science students. It uniquely combines a hands-on approach to data analysis – supported by numerous real data examples and reusable [R] code – with a rigorous treatment of probability and statistical principles. Where contemporary undergraduate textbooks in probability theory or statistics often miss applications and an introductory treatment of modern methods (bootstrapping, Bayes, etc.), and where applied data analysis books often miss a rigorous theoretical treatment, this book provides an accessible but thorough introduction into data analysis, using statistical methods combining the two viewpoints. The book further focuses on methods for dealing with large data-sets and streaming-data and hence provides a single-course introduction of statistical methods for data science.

This book is specially designed to refresh and elevate the level of understanding of the foundational background in probability and distributional theory required to be successful in a graduate-level statistics program. Advanced undergraduate students and introductory graduate students from a variety of quantitative backgrounds will benefit from the transitional bridge that this volume offers, from a more generalized study of undergraduate mathematics and statistics to the career-focused, applied education at the graduate level. In particular, it focuses on growing fields that will be of potential interest to future M.S. and Ph.D. students, as well as advanced undergraduates heading directly into the workplace: data analytics, statistics and biostatistics, and related areas.

Statistical Methods, Third Edition, provides students with a working introduction to statistical methods offering a wide range of applications that emphasize the quantitative skills useful across many academic disciplines. This text takes a classic approach that emphasizes concepts and techniques for working out problems and interpreting results. The book includes research projects, real-world case studies, numerous examples, and data exercises organized by level of difficulty. Students are required to be familiar with algebra. This updated edition includes new exercises applying different techniques and methods; new examples and datasets using current real-world data; new text organization to create a more natural connection between regression and the Analysis of the Variance; new material on generalized linear models; new expansion of nonparametric techniques; new student research projects; and new case studies for gathering, summarizing, and analyzing data. Integrates the classical conceptual approach with mod-

ern day computerized data manipulation and computer applications Accessible to students who may not have a background in probability or calculus Offers reader-friendly exposition, without sacrificing statistical rigor Includes many new data sets in various applied fields such as Psychology, Education, Biostatistics, Agriculture, Economics

This introductory statistics textbook conveys the essential concepts and tools needed to develop and nurture statistical thinking. It presents descriptive, inductive and explorative statistical methods and guides the reader through the process of quantitative data analysis. In the experimental sciences and interdisciplinary research, data analysis has become an integral part of any scientific study. Issues such as judging the credibility of data, analyzing the data, evaluating the reliability of the obtained results and finally drawing the correct and appropriate conclusions from the results are vital. The text is primarily intended for undergraduate students in disciplines like business administration, the social sciences, medicine, politics, macroeconomics, etc. It features a wealth of examples, exercises and solutions with computer code in the statistical programming language R as well as supplementary material that will enable the reader to quickly adapt all methods to their own applications.

In this textbook, basic mathematical models used in Big Data Analytics are presented and application-oriented references to relevant practical issues are made. Necessary mathematical tools are examined and applied to current problems of data analysis, such as brand loyalty, portfolio selection, credit investigation, quality control, product clustering, asset pricing etc. – mainly in an economic context. In addition, we discuss interdisciplinary applications to biology, linguistics, sociology, electrical engineering, computer science and artificial intelligence. For the models, we make use of a wide range of mathematics – from basic disciplines of numerical linear algebra, statistics and optimization to more specialized game, graph and even complexity theories. By doing so, we cover all relevant techniques commonly used in Big Data Analytics. Each chapter starts with a concrete practical problem whose primary aim is to motivate the study of a particular Big Data Analytics technique. Next, mathematical results follow – including important definitions, auxiliary statements and conclusions arising. Case-studies help to deepen the acquired knowledge by applying it in an interdisciplinary context. Exercises serve to improve understanding of the underlying theory. Complete solutions for exercises can be consulted by the interested reader at the end of the textbook; for some which have to be solved numerically, we provide descriptions of algorithms in Python code as supplementary material. This textbook has been recommended and developed for university courses in Germany, Austria and Switzerland.

This 3rd edition of Modern Mathematical Statistics with Applications tries to strike a balance between mathematical foundations and statistical practice. The book provides a clear and current exposition of statistical concepts and methodology, including many examples and exercises based on real data gleaned from publicly available sources. Here is a small but representative selection of scenarios for our examples and exercises based on information in recent articles: Use of the “Big Mac index” by the publication The Economist as a humorous way to compare product costs across nations Visualizing how the concentration of lead levels in cartridges varies for each of five brands of e-cigarettes Describing the distribution of grip size among surgeons and how it impacts their ability to use a particular brand of surgical stapler Estimating the true average odometer reading of used Porsche Boxsters listed for sale on www.cars.com Comparing head acceleration after impact when wearing a football helmet with acceleration without a helmet Investigating the relationship between body mass index and foot load while running The main focus of the book is on presenting and illustrating methods of inferential statistics used by investigators in a wide variety of disciplines, from actuarial science all the way to zoology. It begins with a chapter on descriptive statistics that immediately exposes the reader to the analysis of real data. The next six chapters develop the probability material that facilitates the transition from simply describing data to drawing formal conclusions based on inferential methodology. Point estimation, the use of statistical intervals, and hypothesis testing are the topics of the first three inferential chapters. The remainder of the book explores the use of these methods in a variety of more complex settings. This edition includes many new examples and exercises as well as an introduction to the simulation of events and probability distributions. There are more than 1300 exercises in the book, ranging from very straightforward to reasonably challenging. Many sections have been rewritten with the goal of streamlining and providing a more accessible exposition. Output from the most common statistical software packages is included wherever appropriate (a feature absent from virtually all other mathematical statistics textbooks). The authors hope that their enthusiasm for the theory and applicability of statistics to real world problems will encourage students to pursue more training in the discipline.

Networks have permeated everyday life through everyday realities like the Internet, social networks, and viral marketing. As such, network analysis is an important growth area in the quantitative sciences, with roots in social network analysis going back to the 1930s and graph theory going back centuries. Measurement and analysis are integral components of network research. As a result, statistical methods play a critical role in network analysis. This book is the first of its kind in network research. It can be used as a stand-alone resource in which multiple R packages are used to illustrate how to conduct a wide range of network analyses, from basic manipulation and visualization, to summary and characterization, to modeling of network data. The central package is igraph, which provides extensive capabilities for studying network graphs in R. This text builds on Eric D. Kolaczyk’s book Statistical Analysis of Network Data (Springer, 2009).

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 away 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.

Student-Friendly Coverage of Probability, Statistical Methods, Simulation, and Modeling Tools Incorporating feedback from instructors and researchers who used the previous edition, Probability and Statistics for Computer Scientists, Second Edition helps students understand general methods of stochastic modeling, simulation, and data analysis; make optimal decisions under uncertainty; model and evaluate computer systems and networks; and prepare for advanced probability-based courses. Written in a lively style with simple language, this classroom-tested book can now be used in both one- and two-semester courses. New to the Second Edition Axiomatic introduction of probability Expanded coverage of statistical inference, including standard errors of estimates and their estimation, inference about variances, chi-square tests for independence and goodness of fit, nonparametric statistics, and bootstrap More exercises at the end of each chapter Additional MATLAB® codes, particularly new commands of the Statistics Toolbox In-Depth yet Accessible Treatment of Computer Science-Related Topics Starting with the fundamentals of probability, the text takes students through topics heavily featured in modern computer science, computer engineering, software engineering, and associated fields, such as computer simulations, Monte Carlo methods, stochastic processes, Markov chains, queuing theory, statistical inference, and regression. It also meets the requirements of the Accreditation Board for Engineering and Technology (ABET). Encourages Practical Implementation of Skills Using simple MATLAB commands (easily translatable to other computer languages), the book provides short programs for implementing the methods of probability and statistics as well as for visualizing randomness, the behavior of random variables and stochastic processes, convergence results, and Monte Carlo simulations. Preliminary knowledge of MATLAB is not required. Along with numerous computer science applications and worked examples, the text presents interesting facts and paradoxical statements. Each chapter concludes with a short summary and many exercises.

Taken literally, the title "All of Statistics" is an exaggeration. But in spirit, the title is apt, as the book does cover a much broader range of topics than a typical introductory book on mathematical statistics. This book is for people who want to learn probability and statistics quickly. It is suitable for graduate or advanced undergraduate students in computer science, mathematics, statistics, and related disciplines. The book includes modern topics like non-parametric curve estimation, bootstrapping, and classification, topics that are usually relegated to follow-up courses. The reader is presumed to know calculus and a little linear algebra. No previous knowledge of probability and statistics is required. Statistics, data mining, and machine learning are all concerned with collecting and analysing data.

Roxy Peck, Chris Olsen, and Jay Devore's new edition uses real data and attention-grabbing examples to introduce students to the study of statistics and data analysis. Traditional in structure yet modern in approach, this text guides students through an intuition-based learning process that stresses interpretation and communication of statistical information. Simple notation—including frequent substitution of words for symbols—helps students grasp concepts and cement their comprehension. Hands-on activities and interactive applets allow students to practice statistics firsthand. INTRODUCTION TO STATISTICS AND DATA ANALYSIS includes updated coverage of most major technologies, as well as expanded coverage of probability. Important Notice: Media content referenced within the product description or the product text may not be available in the ebook version.

Join the revolution ignited by the ground-breaking R system! Starting with an introduction to R, covering standard regression methods, then presenting more advanced topics, this book guides users through the practical and powerful tools that the R system provides. The emphasis is on hands-on analysis, graphical display and interpretation of data. The many worked examples, taken from real-world research, are accompanied by commentary on what is done and why. A website provides computer code and data sets, allowing readers to reproduce all analyses. Updates and solutions to selected exercises are also available. Assuming only basic statistical knowledge, the book is ideal for research scientists, final-year undergraduate or graduate level students of applied statistics, and practising statisticians. It is both for learning and for reference. This revised edition reflects changes in R since 2003 and has new material on survival analysis, random coefficient models, and the handling of high-dimensional data.

Core Statistics is a compact starter course on the theory, models, and computational tools needed to make informed use of powerful statistical methods.

Mathematical Statistics with Applications provides a calculus-based theoretical introduction to mathematical statistics while emphasizing interdisciplinary applications as well as exposure to modern statistical computational and simulation concepts that are not covered in other textbooks. Includes the Jackknife, Bootstrap methods, the EM algorithms and Markov chain Monte Carlo methods. Prior probability or statistics knowledge is not required. Step-by-step procedure to solve real problems, making the topic more accessible Exercises blend theory and modern applications Practical, real-world chapter projects Provides an optional section in each chapter on using Minitab, SPSS and SAS commands

This presentation of statistical methods features extensive use of graphical displays for exploring data and for displaying the analysis. The authors demonstrate how to analyze data—showing code, graphics, and accompanying computer listings. They emphasize how to construct and interpret graphs, discuss principles of graphical design, and show how tabular results are used to confirm the visual impressions derived from the graphs. Many of the graphical formats are novel and appear here for the first time in print.

This book is a guide to the practical application of statistics in data analysis as typically encountered in the physical sciences. It is primarily addressed at students and professionals who need to draw quantitative conclusions from experimental data. Although most of the examples are taken from particle physics, the material is presented in a sufficiently general way as to be useful to people from most branches of the physical sciences. The first part of the book describes the basic tools of data analysis: concepts of probability and random variables, Monte Carlo techniques, statistical tests, and

methods of parameter estimation. The last three chapters are somewhat more specialized than those preceding, covering interval estimation, characteristic functions, and the problem of correcting distributions for the effects of measurement errors (unfolding).

Now in its third edition, this classic book is widely considered the leading text on Bayesian methods, lauded for its accessible, practical approach to analyzing data and solving research problems. Bayesian Data Analysis, Third Edition continues to take an applied approach to analysis using up-to-date Bayesian methods. The authors—all leaders in the statistics community—introduce basic concepts from a data-analytic perspective before presenting advanced methods. Throughout the text, numerous worked examples drawn from real applications and research emphasize the use of Bayesian inference in practice. New to the Third Edition Four new chapters on nonparametric modeling Coverage of weakly informative priors and boundary-avoiding priors Updated discussion of cross-validation and predictive information criteria Improved convergence monitoring and effective sample size calculations for iterative simulation Presentations of Hamiltonian Monte Carlo, variational Bayes, and expectation propagation New and revised software code The book can be used in three different ways. For undergraduate students, it introduces Bayesian inference starting from first principles. For graduate students, the text presents effective current approaches to Bayesian modeling and computation in statistics and related fields. For researchers, it provides an assortment of Bayesian methods in applied statistics. Additional materials, including data sets used in the examples, solutions to selected exercises, and software instructions, are available on the book's web page.

Mathematical Statistics with Applications in R, Second Edition, offers a modern calculus-based theoretical introduction to mathematical statistics and applications. The book covers many modern statistical computational and simulation concepts that are not covered in other texts, such as the Jackknife, bootstrap methods, the EM algorithms, and Markov chain Monte Carlo (MCMC) methods such as the Metropolis algorithm, Metropolis-Hastings algorithm and the Gibbs sampler. By combining the discussion on the theory of statistics with a wealth of real-world applications, the book helps students to approach statistical problem solving in a logical manner. This book provides a step-by-step procedure to solve real problems, making the topic more accessible. It includes goodness of fit methods to identify the probability distribution that characterizes the probabilistic behavior or a given set of data. Exercises as well as practical, real-world chapter projects are included, and each chapter has an optional section on using Minitab, SPSS and SAS commands. The text also boasts a wide array of coverage of ANOVA, nonparametric, MCMC, Bayesian and empirical methods; solutions to selected problems; data sets; and an image bank for students. Advanced undergraduate and graduate students taking a one or two semester mathematical statistics course will find this book extremely useful in their studies. Step-by-step procedure to solve real problems, making the topic more accessible Exercises blend theory and modern applications Practical, real-world chapter projects Provides an optional section in each chapter on using Minitab, SPSS and SAS commands Wide array of coverage of ANOVA, Nonparametric, MCMC, Bayesian and empirical methods

This book presents the statistical analysis of compositional data using the log-ratio approach. It includes a wide range of classical and robust statistical methods adapted for compositional data analysis, such as supervised and unsupervised methods like PCA, correlation analysis, classification and regression. In addition, it considers special data structures like high-dimensional compositions and compositional tables. The methodology introduced is also frequently compared to methods which ignore the specific nature of compositional data. It focuses on practical aspects of compositional data analysis rather than on detailed theoretical derivations, thus issues like graphical visualization and preprocessing (treatment of missing values, zeros, outliers and similar artifacts) form an important part of the book. Since it is primarily intended for researchers and students from applied fields like geochemistry, chemometrics, biology and natural sciences, economics, and social sciences, all the proposed methods are accompanied by worked-out examples in R using the package robCompositions.

The past decades have transformed the world of statistical data analysis, with new methods, new types of data, and new computational tools. The aim of Modern Statistics with R is to introduce you to key parts of the modern statistical toolkit. It teaches you: - Data wrangling - importing, formatting, reshaping, merging, and filtering data in R. - Exploratory data analysis - using visualisation and multivariate techniques to explore datasets. - Statistical inference - modern methods for testing hypotheses and computing confidence intervals. - Predictive modelling - regression models and machine learning methods for prediction, classification, and forecasting. - Simulation - using simulation techniques for sample size computations and evaluations of statistical methods. - Ethics in statistics - ethical issues and good statistical practice. - R programming - writing code that is fast, readable, and free from bugs. Starting from the very basics, Modern Statistics with R helps you learn R by working with R. Topics covered range from plotting data and writing simple R code to using cross-validation for evaluating complex predictive models and using simulation for sample size determination. The book includes more than 200 exercises with fully worked solutions. Some familiarity with basic statistical concepts, such as linear regression, is assumed. No previous programming experience is needed.

An ideal textbook for an introductory course on quantitative methods for social scientists—assumes no prior knowledge of statistics or coding Data Analysis for Social Science provides a friendly introduction to the statistical concepts and programming skills needed to conduct and evaluate social scientific studies. Using plain language and assuming no prior knowledge of statistics and coding, the book provides a step-by-step guide to analyzing real-world data with the statistical program R for the purpose of answering a wide range of substantive social science questions. It teaches not only how to perform the analyses but also how to interpret results and identify strengths and limitations. This one-of-a-kind textbook includes supplemental materials to accommodate students with minimal knowledge of math and clearly identifies sections with more advanced material so that readers can skip them if they so choose. Analyzes real-world data using the powerful, open-sourced statistical program R, which is free for everyone to use Teaches how to measure, predict, and explain quantities of interest based on data Shows how to infer population characteristics using survey research, predict outcomes using linear models, and estimate causal effects with and without randomized experiments Assumes no prior knowledge of statistics or coding Specifically designed to accommodate students with a variety of math backgrounds Provides cheatsheets of statistical concepts and R code Supporting materials available online, including real-world datasets and the code to analyze them, plus—for instructor use—sample syllabi, sample lecture slides, additional datasets, and additional exercises with solutions

The high-level language of R is recognized as one of the most powerful and flexible statistical software environments, and is rapidly becoming the standard setting for quantitative analysis, statistics and graphics. R provides free access to unrivalled coverage and cutting-edge applications, enabling the user to apply numerous statistical methods ranging from simple regression to time series or multivariate analysis. Building on the success of the au-

thor's bestselling *Statistics: An Introduction using R*, *The R Book* is packed with worked examples, providing an all inclusive guide to R, ideal for novice and more accomplished users alike. The book assumes no background in statistics or computing and introduces the advantages of the R environment, detailing its applications in a wide range of disciplines. Provides the first comprehensive reference manual for the R language, including practical guidance and full coverage of the graphics facilities. Introduces all the statistical models covered by R, beginning with simple classical tests such as chi-square and t-test. Proceeds to examine more advanced methods, from regression and analysis of variance, through to generalized linear models, generalized mixed models, time series, spatial statistics, multivariate statistics and much more. The R Book is aimed at undergraduates, postgraduates and professionals in science, engineering and medicine. It is also ideal for students and professionals in statistics, economics, geography and the social sciences.

The new edition of this influential textbook, geared towards graduate or advanced undergraduate students, teaches the statistics necessary for financial engineering. In doing so, it illustrates concepts using financial markets and economic data, R Labs with real-data exercises, and graphical and analytic methods for modeling and diagnosing modeling errors. These methods are critical because financial engineers now have access to enormous quantities of data. To make use of this data, the powerful methods in this book for working with quantitative information, particularly about volatility and risks, are essential. Strengths of this fully-revised edition include major additions to the R code and the advanced topics covered. Individual chapters cover, among other topics, multivariate distributions, copulas, Bayesian computations, risk management, and cointegration. Suggested prerequisites are basic knowledge of statistics and probability, matrices and linear algebra, and calculus. There is an appendix on probability, statistics and linear algebra. Practicing financial engineers will also find this book of interest.

An up-to-date, comprehensive treatment of a classic text on missing data in statistics. The topic of missing data has gained considerable attention in recent decades. This new edition by two acknowledged experts on the subject offers an up-to-date account of practical methodology for handling missing data problems. Blending theory and application, authors Roderick Little and Donald Rubin review historical approaches to the subject and describe simple methods for multivariate analysis with missing values. They then provide a coherent theory for analysis of problems based on likelihoods derived from statistical models for the data and the missing data mechanism, and then they apply the theory to a wide range of important missing data problems. *Statistical Analysis with Missing Data*, Third Edition starts by introducing readers to the subject and approaches toward solving it. It looks at the patterns and mechanisms that create the missing data, as well as a taxonomy of missing data. It then goes on to examine missing data in experiments, before discussing complete-case and available-case analysis, including weighting methods. The new edition expands its coverage to include recent work on topics such as nonresponse in sample surveys, causal inference, diagnostic methods, and sensitivity analysis, among a host of other topics. An updated "classic" written by renowned authorities on the subject. Features over 150 exercises (including many new ones). Covers recent work on important methods like multiple imputation, robust alternatives to weighting, and Bayesian methods. Revises previous topics based on past student feedback and class experience. Contains an updated and expanded bibliography. The authors were awarded The Karl Pearson Prize in 2017 by the International Statistical Institute, for a research contribution that has had profound influence on statistical theory, methodology or applications. Their work "has been no less than defining and transforming." (ISI) *Statistical Analysis with Missing Data*, Third Edition is an ideal textbook for upper undergraduate and/or beginning graduate level students of the subject. It is also an excellent source of information for applied statisticians and practitioners in government and industry.

This is the first text in a generation to re-examine the purpose of the mathematical statistics course. The book's approach interweaves traditional topics with data analysis and reflects the use of the computer with close ties to the practice of statistics. The author stresses analysis of data, examines real problems with real data, and motivates the theory. The book's descriptive statistics, graphical displays, and realistic applications stand in strong contrast to traditional texts that are set in abstract settings. Important Notice: Media content referenced within the product description or the product text may not be available in the ebook version.

This is the second edition of a highly successful book which has sold nearly 3000 copies world wide since its publication in 1997. Many chapters will be rewritten and expanded due to a lot of progress in these areas since the publication of the first edition. Bernard Silverman is the author of two other books, each of which has lifetime sales of more than 4000 copies. He has a great reputation both as a researcher and an author. This is likely to be the bestselling book in the Springer Series in Statistics for a couple of years.

This textbook, suitable for an early undergraduate up to a graduate course, provides an overview of many basic principles and techniques needed for modern data analysis. In particular, this book was designed and written as preparation for students planning to take rigorous Machine Learning and Data Mining courses. It introduces key conceptual tools necessary for data analysis, including concentration of measure and PAC bounds, cross validation, gradient descent, and principal component analysis. It also surveys basic techniques in supervised (regression and classification) and unsupervised learning (dimensionality reduction and clustering) through an accessible, simplified presentation. Students are recommended to have some background in calculus, probability, and linear algebra. Some familiarity with programming and algorithms is useful to understand advanced topics on computational techniques.

Learn how to use R to turn raw data into insight, knowledge, and understanding. This book introduces you to R, RStudio, and the tidyverse, a collection of R packages designed to work together to make data science fast, fluent, and fun. Suitable for readers with no previous programming experience, *R for Data Science* is designed to get you doing data science as quickly as possible. Authors Hadley Wickham and Garrett Grolemund guide you through the steps of importing, wrangling, exploring, and modeling your data and communicating the results. You'll get a complete, big-picture understanding of the data science cycle, along with basic tools you need to manage the details. Each section of the book is paired with exercises to help you practice what you've learned along the way. You'll learn how to: **Wrangle**—transform your datasets into a form convenient for analysis **Pro-**

gram—learn powerful R tools for solving data problems with greater clarity and ease **Explore**—examine your data, generate hypotheses, and quickly test them **Model**—provide a low-dimensional summary that captures true "signals" in your dataset **Communicate**—learn R Markdown for integrating prose, code, and results

Theoretical Foundations of Functional Data Analysis, with an Introduction to Linear Operators provides a uniquely broad compendium of the key mathematical concepts and results that are relevant for the theoretical development of functional data analysis (FDA). The self-contained treatment of selected topics of functional analysis and operator theory includes reproducing kernel Hilbert spaces, singular value decomposition of compact operators on Hilbert spaces and perturbation theory for both self-adjoint and non self-adjoint operators. The probabilistic foundation for FDA is described from the perspective of random elements in Hilbert spaces as well as from the viewpoint of continuous time stochastic processes. Nonparametric estimation approaches including kernel and regularized smoothing are also introduced. These tools are then used to investigate the properties of estimators for the mean element, covariance operators, principal components, regression function and canonical correlations. A general treatment of canonical correlations in Hilbert spaces naturally leads to FDA formulations of factor analysis, regression, MANOVA and discriminant analysis. This book will provide a valuable reference for statisticians and other researchers interested in developing or understanding the mathematical aspects of FDA. It is also suitable for a graduate level special topics course.

Modern statistics deals with large and complex data sets, and consequently with models containing a large number of parameters. This book presents a detailed account of recently developed approaches, including the Lasso and versions of it for various models, boosting methods, undirected graphical modeling, and procedures controlling false positive selections. A special characteristic of the book is that it contains comprehensive mathematical theory on high-dimensional statistics combined with methodology, algorithms and illustrations with real data examples. This in-depth approach highlights the methods' great potential and practical applicability in a variety of settings. As such, it is a valuable resource for researchers, graduate students and experts in statistics, applied mathematics and computer science.

Mathematical Statistics with Applications in R, Third Edition, offers a modern calculus-based theoretical introduction to mathematical statistics and applications. The book covers many modern statistical computational and simulation concepts that are not covered in other texts, such as the Jackknife, bootstrap methods, the EM algorithms, and Markov chain Monte Carlo (MCMC) methods, such as the Metropolis algorithm, Metropolis-Hastings algorithm and the Gibbs sampler. By combining discussion on the theory of statistics with a wealth of real-world applications, the book helps students to approach statistical problem-solving in a logical manner. Step-by-step procedure to solve real problems make the topics very accessible. Presents step-by-step procedures to solve real problems, making each topic more accessible. Provides updated application exercises in each chapter, blending theory and modern methods with the use of R. Includes new chapters on Categorical Data Analysis and Extreme Value Theory with Applications. Wide array coverage of ANOVA, Nonparametric, Bayesian and empirical methods.

INTRODUCTION TO STATISTICS AND DATA ANALYSIS introduces you to the study of statistics and data analysis by using real data and attention-grabbing examples. The authors guide you through an intuition-based learning process that stresses interpretation and communication of statistical information. Simple notation—including frequent substitution of words for symbols—helps you grasp concepts and cement your comprehension. You'll also find coverage of most major technologies as a problem-solving tool, plus hands-on activities in each chapter that allow you to practice statistics first-hand.

This open access book presents the key aspects of statistics in Wasserstein spaces, i.e. statistics in the space of probability measures when endowed with the geometry of optimal transportation. Further to reviewing state-of-the-art aspects, it also provides an accessible introduction to the fundamentals of this current topic, as well as an overview that will serve as an invitation and catalyst for further research. *Statistics in Wasserstein spaces* represents an emerging topic in mathematical statistics, situated at the interface between functional data analysis (where the data are functions, thus lying in infinite dimensional Hilbert space) and non-Euclidean statistics (where the data satisfy nonlinear constraints, thus lying on non-Euclidean manifolds). The Wasserstein space provides the natural mathematical formalism to describe data collections that are best modeled as random measures on Euclidean space (e.g. images and point processes). Such random measures carry the infinite dimensional traits of functional data, but are intrinsically nonlinear due to positivity and integrability restrictions. Indeed, their dominating statistical variation arises through random deformations of an underlying template, a theme that is pursued in depth in this monograph.

Explores mathematical statistics in its entirety—from the fundamentals to modern methods. This book introduces readers to point estimation, confidence intervals, and statistical tests. Based on the general theory of linear models, it provides an in-depth overview of the following: analysis of variance (ANOVA) for models with fixed, random, and mixed effects; regression analysis is also first presented for linear models with fixed, random, and mixed effects before being expanded to nonlinear models; statistical multi-decision problems like statistical selection procedures (Bechhofer and Gupta) and sequential tests; and design of experiments from a mathematical-statistical point of view. Most analysis methods have been supplemented by formulae for minimal sample sizes. The chapters also contain exercises with hints for solutions. Translated from the successful German text, *Mathematical Statistics* requires knowledge of probability theory (combinatorics, probability distributions, functions and sequences of random variables), which is typically taught in the earlier semesters of scientific and mathematical study courses. It teaches readers all about statistical analysis and covers the design of experiments. The book also describes optimal allocation in the chapters on regression analysis. Additionally, it features a chapter devoted solely to experimental designs. Classroom-tested with exercises included. Practice-oriented (taken from day-to-day statistical work of the authors). Includes further studies including design of experiments and sample sizing. Presents and uses IBM SPSS Statistics 24 for practical calculations of data. *Mathematical Statistics* is a recommended text for advanced students and practitioners of math, probability, and statistics.

First half of book presents fundamental mathematical definitions, concepts, and facts while remaining half deals with statistics primarily as an interpretive tool. Well-written text, numerous worked examples with step-by-step presentation. Includes 116 tables.