

Applied Bayesian Modeling And Causal Inference From Incomplete Data Perspectives

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Bayesian and Frequentist Regression Methods - Jon Wakefield
2013-01-04

Bayesian and Frequentist Regression Methods provides a modern account of both Bayesian and frequentist methods of regression analysis. Many texts cover one or the other of the approaches, but this is the most comprehensive combination of Bayesian and frequentist methods that exists in one place. The two philosophical approaches to regression methodology are featured here as complementary techniques, with theory and data analysis providing supplementary components of the discussion. In particular, methods are illustrated using a variety of data sets.

The majority of the data sets are drawn from biostatistics but the techniques are generalizable to a wide range of other disciplines.

[Psychiatric Epidemiology](#) - Ezra Susser M.D. 2006-06-01

Searching for the causes of mental disorders is as exciting as it is complex. The relationship between pathophysiology and its overt manifestations is exceedingly intricate, and often the causes of a

disorder are elusive at best. This book is an invaluable resource for anyone trying to track these causes, whether they be clinical researchers, public health practitioners, or psychiatric epidemiologists-in-training. Uniting theory and practice in very clear language, it makes a wonderful contribution to both epidemiologic and psychiatric research. Rather than attempting to review the descriptive epidemiology of mental disorders, this book gives much more dynamic exposition of the thinking and techniques used to establish it. Starting out by tracing the brief history of psychiatric epidemiology, the book describes the study of risk factors as causes of mental disorders. Subsequent sections discuss approaches to investigation of biologic, genetic, or social causes and the statistical analysis of study results. The book concludes by following some of the problems involved in the search for genetic causes of mental disorders, and more complex casual relationships.

Causal Inference in Statistics, Social, and Biomedical

Sciences - Guido W. Imbens 2015-04-06

This text presents statistical methods for studying causal effects and discusses how readers can assess such effects in simple randomized experiments.

Handbook of Statistics - 2012-12-31

The field of statistics not only affects all areas of scientific activity, but also many other matters such as public policy. It is branching rapidly into so many different subjects that a series of handbooks is the only way of comprehensively presenting the various aspects of statistical methodology, applications, and recent developments. The Handbook of Statistics, a series of self-contained reference books. Each volume is devoted to a particular topic in statistics with Volume 28 dealing with bioinformatics. Every chapter is written by prominent workers in the area to which the volume is devoted. The series is addressed to the entire community of statisticians and scientists in various disciplines who use statistical methodology in their work. At the same time, special emphasis is placed on applications-oriented techniques, with the applied statistician in mind as the primary audience. Comprehensively presents the various aspects of statistical methodology Discusses a wide variety of diverse applications and recent developments Contributors are internationally renowned experts in their respective areas

Mixed Models - Eugene Demidenko 2013-08-26

Praise for the First Edition "This book will serve to greatly complement the growing number of texts dealing with mixed models, and I highly recommend including it in one's personal library." —Journal of the American Statistical Association Mixed modeling is a crucial area of statistics, enabling the analysis of clustered and longitudinal data. Mixed Models: Theory and Applications with R, Second Edition fills a gap in existing literature between mathematical and applied statistical books by presenting a powerful examination of mixed model theory and application with special attention given to the implementation in

R. The new edition provides in-depth mathematical coverage of mixed models' statistical properties and numerical algorithms, as well as nontraditional applications, such as regrowth curves, shapes, and images. The book features the latest topics in statistics including modeling of complex clustered or longitudinal data, modeling data with multiple sources of variation, modeling biological variety and heterogeneity, Healthy Akaike Information Criterion (HAIC), parameter multidimensionality, and statistics of image processing. Mixed Models: Theory and Applications with R, Second Edition features unique applications of mixed model methodology, as well as: Comprehensive theoretical discussions illustrated by examples and figures Over 300 exercises, end-of-section problems, updated data sets, and R subroutines Problems and extended projects requiring simulations in R intended to reinforce material Summaries of major results and general points of discussion at the end of each chapter Open problems in mixed modeling methodology, which can be used as the basis for research or PhD dissertations Ideal for graduate-level courses in mixed statistical modeling, the book is also an excellent reference for professionals in a range of fields, including cancer research, computer science, and engineering.

Bayesian Item Response Modeling - Jean-Paul Fox 2010-05-19

The modeling of item response data is governed by item response theory, also referred to as modern test theory. The field of inquiry of item response theory has become very large and shows the enormous progress that has been made. The mainstream literature is focused on frequentist statistical methods for estimating model parameters and evaluating model fit. However, the Bayesian methodology has shown great potential, particularly for making further improvements in the statistical modeling process. The Bayesian approach has two important features that make it attractive for modeling item response data. First, it enables the possibility of incorporating nondata information beyond the observed responses into the analysis. The Bayesian methodology

is also very clear about how additional information can be used. Second, the Bayesian approach comes with powerful simulation-based estimation methods. These methods make it possible to handle all kinds of priors and data-generating models. One of my motives for writing this book is to give an introduction to the Bayesian methodology for modeling and analyzing item response data. A Bayesian counterpart is presented to the many popular item response theory books (e.g., Baker and Kim 2004; De Boeck and Wilson, 2004; Hambleton and Swaminathan, 1985; van der Linden and Hambleton, 1997) that are mainly or completely focused on frequentist methods. The usefulness of the Bayesian methodology is illustrated by discussing and applying a range of Bayesian item response models.

Migration, Transfers and Economic Decision Making among Agricultural Households - Calogero Carletto 2020-08-20

The increasing volume of remittances and public transfers in rural areas of the developing world has raised hopes that these cash inflows may serve as an effective mechanism for reducing poverty in the long term by facilitating investments and raising productivity, particularly in agriculture where market failures are most manifest. This book systematically tests the empirical relationship between cash transfers and productive spending in agriculture amongst rural households in six different countries of the developing world. Together, the studies point to little impact of migration and public and private transfers on agricultural productivity, instead facilitating a transition away from agriculture or to a less labour intensive type of agriculture. From a policy perspective the studies raise the question of how to maintain rural economies, as migration and social assistance are unlikely to provide a sustainable way to overcome rural poverty in the long run for those that remain in rural areas. For the foreseeable future, agriculture will play an important role in alleviating poverty and sustaining growth in rural areas. Yet, public and private transfers are not providing much of the

impetus needed to raise the sector's productivity. Whether the transfers are invested in agriculture will ultimately depend on the attractiveness of the sector, which is largely determined by the policies of governments and donors. This book was published as a special issue of the Journal of Development Studies.

Bayesian Data Analysis, Third Edition - Andrew Gelman 2013-11-01

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.

Statistical Analysis with Missing Data - Roderick J. A. Little 2019-03-21

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 *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.

[Statistical Rethinking](#) - Richard McElreath 2018-01-03

Statistical Rethinking: A Bayesian Course with Examples in R and Stan builds readers' knowledge of and confidence in statistical modeling. Reflecting the need for even minor programming in today's model-based statistics, the book pushes readers to perform step-by-step calculations that are usually automated. This unique computational approach ensures that readers understand enough of the details to make reasonable choices and interpretations in their own modeling work. The text presents generalized linear multilevel models from a Bayesian perspective, relying on a simple logical interpretation of Bayesian probability and maximum entropy. It covers from the basics of regression to multilevel models. The author also discusses measurement error, missing data, and Gaussian process models for spatial and network autocorrelation. By using complete R code examples throughout, this book provides a practical foundation for performing statistical inference. Designed for both PhD students and seasoned professionals in the natural and social sciences, it prepares them for more advanced or specialized statistical modeling. **Web Resource** The book is accompanied by an R package (rethinking) that is available on the author's website and GitHub. The two core functions (map and map2stan) of this package allow a variety of statistical models to be constructed from standard model formulas.

A Student's Guide to Bayesian Statistics - Ben Lambert
2018-04-20

Supported by a wealth of learning features, exercises, and visual elements as well as online video tutorials and interactive simulations, this book is the first student-focused introduction to Bayesian statistics. Without sacrificing technical integrity for the sake of simplicity, the author draws upon accessible, student-friendly language to provide approachable instruction perfectly aimed at statistics and Bayesian newcomers. Through a logical structure that introduces and builds upon key concepts in a gradual way and slowly acclimatizes students to using R and Stan

software, the book covers: An introduction to probability and Bayesian inference Understanding Bayes' rule Nuts and bolts of Bayesian analytic methods Computational Bayes and real-world Bayesian analysis Regression analysis and hierarchical methods This unique guide will help students develop the statistical confidence and skills to put the Bayesian formula into practice, from the basic concepts of statistical inference to complex applications of analyses.

Bayesian Analysis of Stochastic Process Models - David Insua 2012-04-02

Bayesian analysis of complex models based on stochastic processes has in recent years become a growing area. This book provides a unified treatment of Bayesian analysis of models based on stochastic processes, covering the main classes of stochastic processing including modeling, computational, inference, forecasting, decision making and important applied models. Key features: Explores Bayesian analysis of models based on stochastic processes, providing a unified treatment. Provides a thorough introduction for research students. Computational tools to deal with complex problems are illustrated along with real life case studies Looks at inference, prediction and decision making. Researchers, graduate and advanced undergraduate students interested in stochastic processes in fields such as statistics, operations research (OR), engineering, finance, economics, computer science and Bayesian analysis will benefit from reading this book. With numerous applications included, practitioners of OR, stochastic modelling and applied statistics will also find this book useful.

Statistical Causal Inferences and Their Applications in Public Health Research - Hua He 2016-10-26

This book compiles and presents new developments in statistical causal inference. The accompanying data and computer programs are publicly available so readers may replicate the model development and data analysis presented in each chapter. In this

way, methodology is taught so that readers may implement it directly. The book brings together experts engaged in causal inference research to present and discuss recent issues in causal inference methodological development. This is also a timely look at causal inference applied to scenarios that range from clinical trials to mediation and public health research more broadly. In an academic setting, this book will serve as a reference and guide to a course in causal inference at the graduate level (Master's or Doctorate). It is particularly relevant for students pursuing degrees in statistics, biostatistics, and computational biology. Researchers and data analysts in public health and biomedical research will also find this book to be an important reference.

Regression and Other Stories - Andrew Gelman 2020-07-23
A practical approach to using regression and computation to solve real-world problems of estimation, prediction, and causal inference.

Modeling and Reasoning with Bayesian Networks - Adnan Darwiche 2009-04-06

This book provides a thorough introduction to the formal foundations and practical applications of Bayesian networks. It provides an extensive discussion of techniques for building Bayesian networks that model real-world situations, including techniques for synthesizing models from design, learning models from data, and debugging models using sensitivity analysis. It also treats exact and approximate inference algorithms at both theoretical and practical levels. The author assumes very little background on the covered subjects, supplying in-depth discussions for theoretically inclined readers and enough practical details to provide an algorithmic cookbook for the system developer.

Applied Bayesian Modeling and Causal Inference from Incomplete-Data Perspectives - Andrew Gelman 2004-09-03

This book brings together a collection of articles on statistical methods relating to missing data analysis, including multiple

imputation, propensity scores, instrumental variables, and Bayesian inference. Covering new research topics and real-world examples which do not feature in many standard texts. The book is dedicated to Professor Don Rubin (Harvard). Don Rubin has made fundamental contributions to the study of missing data. Key features of the book include: Comprehensive coverage of an important area for both research and applications. Adopts a pragmatic approach to describing a wide range of intermediate and advanced statistical techniques. Covers key topics such as multiple imputation, propensity scores, instrumental variables and Bayesian inference. Includes a number of applications from the social and health sciences. Edited and authored by highly respected researchers in the area.

Causal Analysis in Population Studies - Henriette Engelhardt
2009-05-05

The central aim of many studies in population research and demography is to explain cause-effect relationships among variables or events. For decades, population scientists have concentrated their efforts on estimating the 'causes of effects' by applying standard cross-sectional and dynamic regression techniques, with regression coefficients routinely being understood as estimates of causal effects. The standard approach to infer the 'effects of causes' in natural sciences and in psychology is to conduct randomized experiments. In population studies, experimental designs are generally infeasible. In population studies, most research is based on non-experimental designs (observational or survey designs) and rarely on quasi-experiments or natural experiments. Using non-experimental designs to infer causal relationships—i.e. relationships that can ultimately inform policies or interventions—is a complex undertaking. Specifically, treatment effects can be inferred from non-experimental data with a counterfactual approach. In this counterfactual perspective, causal effects are defined as the difference between the potential outcome irrespective of whether

or not an individual had received a certain treatment (or experienced a certain cause). The counterfactual approach to estimate effects of causes from quasi-experimental data or from observational studies was first proposed by Rubin in 1974 and further developed by James Heckman and others. This book presents both theoretical contributions and empirical applications of the counterfactual approach to causal inference.

Encyclopedia of Epidemiology - Sarah Boslaugh 2008
Presents information from the field of epidemiology in a less technical, more accessible format. Covers major topics in epidemiology, from risk ratios to case-control studies to mediating and moderating variables, and more. Relevant topics from related fields such as biostatistics and health economics are also included.

Bayesian Methods - Jeff Gill 2007-11-26

The first edition of Bayesian Methods: A Social and Behavioral Sciences Approach helped pave the way for Bayesian approaches to become more prominent in social science methodology. While the focus remains on practical modeling and basic theory as well as on intuitive explanations and derivations without skipping steps, this second edition incorporates

Foundations of Linear and Generalized Linear Models - Alan Agresti 2015-02-23

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 model building. 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.

Bayesian Psychometric Modeling - Roy Levy 2017-07-28

A Single Cohesive Framework of Tools and Procedures for Psychometrics and Assessment *Bayesian Psychometric Modeling* presents a unified Bayesian approach across traditionally separate families of psychometric models. It shows that Bayesian techniques, as alternatives to conventional approaches, offer distinct and profound advantages in achieving many goals of psychometrics. Adopting a Bayesian approach can aid in unifying seemingly disparate—and sometimes conflicting—ideas and activities in psychometrics. This book explains both how to perform psychometrics using Bayesian methods and why many of

the activities in psychometrics align with Bayesian thinking. The first part of the book introduces foundational principles and statistical models, including conceptual issues, normal distribution models, Markov chain Monte Carlo estimation, and regression. Focusing more directly on psychometrics, the second part covers popular psychometric models, including classical test theory, factor analysis, item response theory, latent class analysis, and Bayesian networks. Throughout the book, procedures are illustrated using examples primarily from educational assessments. A supplementary website provides the datasets, WinBUGS code, R code, and Netica files used in the examples.

Applied Bayesian Modeling and Causal Inference from Incomplete-Data Perspectives - Andrew Gelman 2004-10-22

This book brings together a collection of articles on statistical methods relating to missing data analysis, including multiple imputation, propensity scores, instrumental variables, and Bayesian inference. Covering new research topics and real-world examples which do not feature in many standard texts. The book is dedicated to Professor Don Rubin (Harvard). Don Rubin has made fundamental contributions to the study of missing data. Key features of the book include: Comprehensive coverage of an important area for both research and applications. Adopts a pragmatic approach to describing a wide range of intermediate and advanced statistical techniques. Covers key topics such as multiple imputation, propensity scores, instrumental variables and Bayesian inference. Includes a number of applications from the social and health sciences. Edited and authored by highly respected researchers in the area.

Modern Epidemiology - Kenneth J. Rothman 2008

The thoroughly revised and updated Third Edition of the acclaimed *Modern Epidemiology* reflects both the conceptual development of this evolving science and the increasingly focal role that epidemiology plays in dealing with public health and

medical problems. Coauthored by three leading epidemiologists, with sixteen additional contributors, this Third Edition is the most comprehensive and cohesive text on the principles and methods of epidemiologic research. The book covers a broad range of concepts and methods, such as basic measures of disease frequency and associations, study design, field methods, threats to validity, and assessing precision. It also covers advanced topics in data analysis such as Bayesian analysis, bias analysis, and hierarchical regression. Chapters examine specific areas of research such as disease surveillance, ecologic studies, social epidemiology, infectious disease epidemiology, genetic and molecular epidemiology, nutritional epidemiology, environmental epidemiology, reproductive epidemiology, and clinical epidemiology.

Philosophy of Statistics - 2011-05-31

Statisticians and philosophers of science have many common interests but restricted communication with each other. This volume aims to remedy these shortcomings. It provides state-of-the-art research in the area of philosophy of statistics by encouraging numerous experts to communicate with one another without feeling “restricted by their disciplines or thinking “piecemeal in their treatment of issues. A second goal of this book is to present work in the field without bias toward any particular statistical paradigm. Broadly speaking, the essays in this Handbook are concerned with problems of induction, statistics and probability. For centuries, foundational problems like induction have been among philosophers’ favorite topics; recently, however, non-philosophers have increasingly taken a keen interest in these issues. This volume accordingly contains papers by both philosophers and non-philosophers, including scholars from nine academic disciplines. Provides a bridge between philosophy and current scientific findings Covers theory and applications Encourages multi-disciplinary dialogue
Regression and Other Stories - Andrew Gelman 2020-07-23

Most textbooks on regression focus on theory and the simplest of examples. Real statistical problems, however, are complex and subtle. This is not a book about the theory of regression. It is about using regression to solve real problems of comparison, estimation, prediction, and causal inference. Unlike other books, it focuses on practical issues such as sample size and missing data and a wide range of goals and techniques. It jumps right in to methods and computer code you can use immediately. Real examples, real stories from the authors' experience demonstrate what regression can do and its limitations, with practical advice for understanding assumptions and implementing methods for experiments and observational studies. They make a smooth transition to logistic regression and GLM. The emphasis is on computation in R and Stan rather than derivations, with code available online. Graphics and presentation aid understanding of the models and model fitting.

Counterfactuals and Causal Inference - Stephen L. Morgan 2015

This new edition aims to convince social scientists to take a counterfactual approach to the core questions of their fields.
Applied Bayesian Modelling - Peter Congdon 2014-05-23
This book provides an accessible approach to Bayesian computing and data analysis, with an emphasis on the interpretation of real data sets. Following in the tradition of the successful first edition, this book aims to make a wide range of statistical modeling applications accessible using tested code that can be readily adapted to the reader's own applications. The second edition has been thoroughly reworked and updated to take account of advances in the field. A new set of worked examples is included. The novel aspect of the first edition was the coverage of statistical modeling using WinBUGS and OPENBUGS. This feature continues in the new edition along with examples using R to broaden appeal and for completeness of coverage.
Bioinformatics in Human Health and Heredity - Ranajit

Chakraborty 2012-10-03

The field of statistics not only affects all areas of scientific activity, but also many other matters such as public policy. It is branching rapidly into so many different subjects that a series of handbooks is the only way of comprehensively presenting the various aspects of statistical methodology, applications, and recent developments. The Handbook of Statistics, a series of self-contained reference books. Each volume is devoted to a particular topic in statistics with Volume 28 dealing with bioinformatics. Every chapter is written by prominent workers in the area to which the volume is devoted. The series is addressed to the entire community of statisticians and scientists in various disciplines who use statistical methodology in their work. At the same time, special emphasis is placed on applications-oriented techniques, with the applied statistician in mind as the primary audience. Comprehensively presents the various aspects of statistical methodology Discusses a wide variety of diverse applications and recent developments Contributors are internationally renowned experts in their respective areas

Applied Bayesian Statistics - Scott M. Lynch 2022-10-31

Bayesian statistical analyses have become increasingly common over the last two decades. The rapid increase in computing power that facilitated their implementation coincided with major changes in the research interests of, and data availability for, social scientists. Specifically, the last two decades have seen an increase in the availability of panel data sets, other hierarchically structured data sets including spatially organized data, along with interests in life course processes and the influence of context on individual behavior and outcomes. The Bayesian approach to statistics is well-suited for these types of data and research questions. Applied Bayesian Statistics is an introduction to these methods that is geared toward social scientists. Author Scott M. Lynch makes the material accessible by emphasizing application more than theory, explaining the math in a step-by-step fashion,

and demonstrating the Bayesian approach in analyses of U.S. political trends drawing on data from the General Social Survey.

Loss Models - Stuart A. Klugman 2012-09-04

Praise for the Third Edition "This book provides in-depth coverage of modelling techniques used throughout many branches of actuarial science. . . . The exceptional high standard of this book has made it a pleasure to read." —Annals of Actuarial Science Newly organized to focus exclusively on material tested in the Society of Actuaries' Exam C and the Casualty Actuarial Society's Exam 4, Loss Models: From Data to Decisions, Fourth Edition continues to supply actuaries with a practical approach to the key concepts and techniques needed on the job. With updated material and extensive examples, the book successfully provides the essential methods for using available data to construct models for the frequency and severity of future adverse outcomes. The book continues to equip readers with the tools needed for the construction and analysis of mathematical models that describe the process by which funds flow into and out of an insurance system. Focusing on the loss process, the authors explore key quantitative techniques including random variables, basic distributional quantities, and the recursive method, and discuss techniques for classifying and creating distributions. Parametric, non-parametric, and Bayesian estimation methods are thoroughly covered along with advice for choosing an appropriate model. New features of this Fourth Edition include: Expanded discussion of working with large data sets, now including more practical elements of constructing decrement tables Added coverage of methods for simulating several special situations An updated presentation of Bayesian estimation, outlining conjugate prior distributions and the linear exponential family as well as related computational issues Throughout the book, numerous examples showcase the real-world applications of the presented concepts, with an emphasis on calculations and spreadsheet implementation. A wealth of new exercises taken from previous

Exam C/4 exams allows readers to test their comprehension of the material, and a related FTP site features the book's data sets. Loss Models, Fourth Edition is an indispensable resource for students and aspiring actuaries who are preparing to take the SOA and CAS examinations. The book is also a valuable reference for professional actuaries, actuarial students, and anyone who works with loss and risk models. To explore our additional offerings in actuarial exam preparation visit www.wiley.com/go/c4actuarial .

The SAGE Handbook of Multilevel Modeling - Marc A. Scott
2013-08-31

In this important new Handbook, the editors have gathered together a range of leading contributors to introduce the theory and practice of multilevel modeling. The Handbook establishes the connections in multilevel modeling, bringing together leading experts from around the world to provide a roadmap for applied researchers linking theory and practice, as well as a unique arsenal of state-of-the-art tools. It forges vital connections that cross traditional disciplinary divides and introduces best practice in the field. Part I establishes the framework for estimation and inference, including chapters dedicated to notation, model selection, fixed and random effects, and causal inference. Part II develops variations and extensions, such as nonlinear, semiparametric and latent class models. Part III includes discussion of missing data and robust methods, assessment of fit and software. Part IV consists of exemplary modeling and data analyses written by methodologists working in specific disciplines. Combining practical pieces with overviews of the field, this Handbook is essential reading for any student or researcher looking to apply multilevel techniques in their own research.

Causal Inference and Scientific Paradigms in Epidemiology - Steven S. Coughlin 2010

This anthology of articles on causal inference and scientific

paradigms in epidemiology covers several important topics including the search for causal explanations, the strengths and limitations of causal criteria, quantitative approaches for assessing causal relationships that are relevant to epidemiology and emerging paradigms in epidemiologic research. In order to provide historical context, an overview of philosophical and historical developments relevant to causal inference in epidemiology and public health is also provided. Several theoretical and applied aspects of causal inference are dealt with. The aim of this Ebook is not only to summarize important developments in causal inference in epidemiology but also to identify possible ways to enhance the search for causal explanations for diseases and injuries. Examples are provided from such fields as chronic disease epidemiology, Veterans health, and environmental epidemiology. A particular goal of the Ebook is to provide ideas for strengthening causal inference in epidemiology in the context of refined research paradigms. These topics are important because the results of epidemiologic studies contribute to generalizable knowledge by clarifying the causes of diseases, by combining epidemiologic data with information from other disciplines (for example, psychology and industrial hygiene), by evaluating the consistency of epidemiologic data with etiological hypotheses about causation, and by providing the basis for evaluating procedures for health promotion and prevention and public health practices.

Multilevel Modeling of Social Problems - Robert B. Smith
2011-02-26

Uniquely focusing on intersections of social problems, multilevel statistical modeling, and causality; the substantively and methodologically integrated chapters of this book clarify basic strategies for developing and testing multilevel linear models (MLMs), and drawing causal inferences from such models. These models are also referred to as hierarchical linear models (HLMs) or mixed models. The statistical modeling of multilevel data

structures enables researchers to combine contextual and longitudinal analyses appropriately. But researchers working on social problems seldom apply these methods, even though the topics they are studying and the empirical data call for their use. By applying multilevel modeling to hierarchical data structures, this book illustrates how the use of these methods can facilitate social problems research and the formulation of social policies. It gives the reader access to working data sets, computer code, and analytic techniques, while at the same time carefully discussing issues of causality in such models. This book innovatively:

- Develops procedures for studying social, economic, and human development.
- Uses typologies to group (i.e., classify or nest) the level of random macro-level factors.
- Estimates models with Poisson, binomial, and Gaussian end points using SAS's generalized linear mixed models (GLIMMIX) procedure.
- Selects appropriate covariance structures for generalized linear mixed models.
- Applies difference-in-differences study designs in the multilevel modeling of intervention studies.
- Calculates propensity scores by applying Firth logistic regression to Goldberger-corrected data.
- Uses the Kenward-Rogers correction in mixed models of repeated measures.
- Explicates differences between associational and causal analysis of multilevel models.
- Consolidates research findings via meta-analysis and methodological critique.
- Develops criteria for assessing a study's validity and zone of causality.

Because of its social problems focus, clarity of exposition, and use of state-of-the-art procedures; policy researchers, methodologists, and applied statisticians in the social sciences (specifically, sociology, social psychology, political science, education, and public health) will find this book of great interest. It can be used as a primary text in courses on multilevel modeling or as a primer for more advanced texts.

Structural Equation Modeling - Jichuan Wang 2019-09-05
Presents a useful guide for applications of SEM whilst

systematically demonstrating various SEM models using Mplus. Focusing on the conceptual and practical aspects of Structural Equation Modeling (SEM), this book demonstrates basic concepts and examples of various SEM models, along with updates on many advanced methods, including confirmatory factor analysis (CFA) with categorical items, bifactor model, Bayesian CFA model, item response theory (IRT) model, graded response model (GRM), multiple imputation (MI) of missing values, plausible values of latent variables, moderated mediation model, Bayesian SEM, latent growth modeling (LGM) with individually varying times of observations, dynamic structural equation modeling (DSEM), residual dynamic structural equation modeling (RDSEM), testing measurement invariance of instrument with categorical variables, longitudinal latent class analysis (LLCA), latent transition analysis (LTA), growth mixture modeling (GMM) with covariates and distal outcome, manual implementation of the BCH method and the three-step method for mixture modeling, Monte Carlo simulation power analysis for various SEM models, and estimate sample size for latent class analysis (LCA) model. The statistical modeling program Mplus Version 8.2 is featured with all models updated. It provides researchers with a flexible tool that allows them to analyze data with an easy-to-use interface and graphical displays of data and analysis results. Intended as both a teaching resource and a reference guide, and written in non-mathematical terms, *Structural Equation Modeling: Applications Using Mplus*, 2nd edition provides step-by-step instructions of model specification, estimation, evaluation, and modification. Chapters cover: Confirmatory Factor Analysis (CFA); Structural Equation Models (SEM); SEM for Longitudinal Data; Multi-Group Models; Mixture Models; and Power Analysis and Sample Size Estimate for SEM. Presents a useful reference guide for applications of SEM while systematically demonstrating various advanced SEM models. Discusses and demonstrates various SEM models using both cross-sectional and longitudinal

data with both continuous and categorical outcomes Provides step-by-step instructions of model specification and estimation, as well as detailed interpretation of Mplus results using real data sets Introduces different methods for sample size estimate and statistical power analysis for SEM Structural Equation Modeling is an excellent book for researchers and graduate students of SEM who want to understand the theory and learn how to build their own SEM models using Mplus.

Data Analysis Using Regression and Multilevel/Hierarchical Models - Andrew Gelman 2007

This book, first published in 2007, is for the applied researcher performing data analysis using linear and nonlinear regression and multilevel models.

Generalized Linear Models - Jeff Gill 2019-05-14

Explaining the theoretical underpinning of generalized linear models, this text enables researchers to decide how to select the best way to adapt their data for this type of analysis, with examples to illustrate the application of GLM.

The Oxford Handbook of Applied Bayesian Analysis - Anthony O' Hagan 2010-03-18

Bayesian analysis has developed rapidly in applications in the last two decades and research in Bayesian methods remains dynamic and fast-growing. Dramatic advances in modelling concepts and computational technologies now enable routine application of Bayesian analysis using increasingly realistic stochastic models, and this drives the adoption of Bayesian approaches in many areas of science, technology, commerce, and industry. This Handbook explores contemporary Bayesian analysis across a variety of application areas. Chapters written by leading exponents of applied Bayesian analysis showcase the scientific ease and natural application of Bayesian modelling, and present solutions to real, engaging, societally important and demanding problems. The chapters are grouped into five general areas: Biomedical & Health Sciences; Industry, Economics & Finance;

Environment & Ecology; Policy, Political & Social Sciences; and Natural & Engineering Sciences, and Appendix material in each touches on key concepts, models, and techniques of the chapter that are also of broader pedagogic and applied interest.

Statistical Rethinking - Richard McElreath 2020-03-13

Statistical Rethinking: A Bayesian Course with Examples in R and Stan builds your knowledge of and confidence in making inferences from data. Reflecting the need for scripting in today's model-based statistics, the book pushes you to perform step-by-step calculations that are usually automated. This unique computational approach ensures that you understand enough of the details to make reasonable choices and interpretations in your own modeling work. The text presents causal inference and generalized linear multilevel models from a simple Bayesian perspective that builds on information theory and maximum entropy. The core material ranges from the basics of regression to advanced multilevel models. It also presents measurement error, missing data, and Gaussian process models for spatial and phylogenetic confounding. The second edition emphasizes the directed acyclic graph (DAG) approach to causal inference, integrating DAGs into many examples. The new edition also contains new material on the design of prior distributions, splines, ordered categorical predictors, social relations models, cross-validation, importance sampling, instrumental variables, and Hamiltonian Monte Carlo. It ends with an entirely new chapter that goes beyond generalized linear modeling, showing how domain-specific scientific models can be built into statistical analyses. Features Integrates working code into the main text Illustrates concepts through worked data analysis examples Emphasizes understanding assumptions and how assumptions are reflected in code Offers more detailed explanations of the mathematics in optional sections Presents examples of using the dagitty R package to analyze causal graphs Provides the rethinking R package on the author's website and on GitHub

Methods in Social Epidemiology - J. Michael Oakes 2006-05-11
Social epidemiology is the study of how social interactions—social norms, laws, institutions, conventia, social conditions and behavior—affect the health of populations. This practical, comprehensive introduction to methods in social epidemiology is written by experts in the field. It is perfectly timed for the growth in interest among those in public health, community health, preventive medicine, sociology, political science, social work, and other areas of social research. Topics covered are: Introduction: Advancing Methods in Social Epidemiology The History of Methods of Social Epidemiology to 1965 Indicators of Socioeconomic Position Measuring and Analyzing 'Race' Racism and Racial Discrimination Measuring Poverty Measuring Health Inequalities A Conceptual Framework for Measuring Segregation and its Association with Population Outcomes Measures of Residential Community Contexts Using Census Data to Approximate Neighborhood Effects Community-based Participatory Research: Rationale and Relevance for Social Epidemiology Network Methods in Social Epidemiology Identifying Social Interactions: A Review, Multilevel Studies Experimental Social Epidemiology: Controlled Community Trials Propensity Score Matching Methods for Social Epidemiology Natural Experiments and Instrumental Variable Analyses in Social Epidemiology and Using Causal Diagrams to Understand Common Problems in Social Epidemiology. "Publication of this highly informative textbook clearly reflects the coming of age of many social epidemiology methods, the importance of which rests on their potential contribution to significantly improving the effectiveness of the population-based approach to prevention. This book should be of great interest not only to more advanced epidemiology students but also to epidemiologists in general, particularly those concerned with health policy and the translation of epidemiologic findings into public health practice. The cause of achieving a 'more complete' epidemiology envisaged

by the editors has been significantly advanced by this excellent textbook." —Moyses Szklo, professor of epidemiology and editor-in-chief, American Journal of Epidemiology, Johns Hopkins University "Social epidemiology is a comparatively new field of inquiry that seeks to describe and explain the social and geographic distribution of health and of the determinants of health. This book considers the major methodological challenges facing this important field. Its chapters, written by experts in a variety of disciplines, are most often authoritative, typically provocative, and often debatable, but always worth reading." —Stephen W. Raudenbush, Lewis-Sebring Distinguished Service Professor, Department of Sociology, University of Chicago "The roadmap for a new generation of social epidemiologists. The publication of this treatise is a significant event in the history of the discipline." —Ichiro Kawachi, professor of social epidemiology, Department of Society, Human Development, and Health, Harvard University "Methods in Social Epidemiology not only illuminates the difficult questions that future generations of social epidemiologists must ask, it also identifies the paths they must boldly travel in the pursuit of answers, if this exciting interdisciplinary science is to realize its full potential. This beautifully edited volume appears at just the right moment to exert a profound influence on the field." —Sherman A. James, Susan B. King Professor of Public Policy Studies, professor of Community and Family Medicine, professor of African-American Studies, Duke University
Modern Applied Regressions - Jun Xu 2022-12-08
Modern Applied Regressions creates an intricate and colorful mural with mosaics of categorical and limited response variable (CLRV) models using both Bayesian and Frequentist approaches. Written for graduate students, junior researchers, and quantitative analysts in behavioral, health, and social sciences, this text provides details for doing Bayesian and frequentist data analysis of CLRV models. Each chapter can be read and studied

separately with R coding snippets and template interpretation for easy replication. Along with the doing part, the text provides basic and accessible statistical theories behind these models and uses a narrative style to recount their origins and evolution. This book first scaffolds both Bayesian and frequentist paradigms for regression analysis, and then moves onto different types of categorical and limited response variable models, including binary, ordered, multinomial, count, and survival regression. Each of the middle four chapters discusses a major type of CLRV regression that subsumes an array of important variants and extensions. The discussion of all major types usually begins with the history and evolution of the prototypical model, followed by

the formulation of basic statistical properties and an elaboration on the doing part of the model and its extension. The doing part typically includes R codes, results, and their interpretation. The last chapter discusses advanced modeling and predictive techniques—multilevel modeling, causal inference and propensity score analysis, and machine learning—that are largely built with the toolkits designed for the CLRV models previously covered. The online resources for this book, including R and Stan codes and supplementary notes, can be accessed at <https://sites.google.com/site/socjunxu/home/statistics/modern-applied-regressions>.