

Case Studies In Bayesian Statistical Modelling And Analysis

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Bayesian Biostatistics - Emmanuel Lesaffre 2012-08-13

The growth of biostatistics has been phenomenal in recent years and has been marked by considerable technical innovation in both methodology and computational practicality. One area that has experienced significant growth is Bayesian methods. The growing use of Bayesian methodology has taken place partly due to an increasing number of practitioners valuing the Bayesian paradigm as matching that of scientific discovery. In addition, computational advances have allowed for more complex models to be fitted routinely to realistic data sets. Through examples, exercises and a combination of introductory and more advanced chapters, this book provides an invaluable understanding of the complex world of biomedical statistics illustrated via a diverse range of applications taken from epidemiology, exploratory clinical studies, health promotion studies, image analysis and clinical trials. Key Features: Provides an authoritative account of Bayesian methodology, from its most basic elements to its practical implementation, with an emphasis on healthcare techniques. Contains introductory explanations of Bayesian principles common to all areas of application. Presents clear and concise examples in biostatistics applications such as clinical trials, longitudinal

studies, bioassay, survival, image analysis and bioinformatics. Illustrated throughout with examples using software including WinBUGS, OpenBUGS, SAS and various dedicated R programs. Highlights the differences between the Bayesian and classical approaches. Supported by an accompanying website hosting free software and case study guides. Bayesian Biostatistics introduces the reader smoothly into the Bayesian statistical methods with chapters that gradually increase in level of complexity. Master students in biostatistics, applied statisticians and all researchers with a good background in classical statistics who have interest in Bayesian methods will find this book useful.

Bayesian Approach to Intrepreting Archaeological Data - Caitlin E. Buck 1996-08-06

Statistics in Practice A new series of practical books outlining the use of statistical techniques in a wide range of application areas: * Human and Biological Sciences * Earth and Environmental Sciences * Industry, Commerce and Finance The authors of this important text explore the processes through which archaeologists analyse their data and how these can be made more rigorous and effective by sound statistical modelling. They assume relatively little previous statistical or

mathematical knowledge. Introducing the idea underlying the Bayesian approach to the statistical analysis of data and their subsequent interpretation, the authors demonstrate the major advantage of this approach, i.e. that it allows the incorporation of relevant prior knowledge or beliefs into the analysis. By doing so it provides a logical and coherent way of updating beliefs from those held before observing the data to those held after taking the data into account. To illustrate the power and effectiveness of mathematical and statistical modelling within the Bayesian framework, a variety of real case studies are presented covering areas of common interest to archaeologists. These case studies cover applications in areas such as radiocarbon dating, spatial analysis, provenance studies and other dating methods. Background to these case studies is provided for those readers not so familiar with the subject. Thus, the book provides an examination of the theoretical and practical consequences of Bayesian analysis for examining problems in archaeology. Students of archaeology and related disciplines and professional archaeologists will find the book an informative and practical introduction to the subject.

Handbook of Mixture Analysis - Sylvia Fruhwirth-Schnatter 2019-01-04
Mixture models have been around for over 150 years, and they are found in many branches of statistical modelling, as a versatile and multifaceted tool. They can be applied to a wide range of data: univariate or multivariate, continuous or categorical, cross-sectional, time series, networks, and much more. Mixture analysis is a very active research topic in statistics and machine learning, with new developments in methodology and applications taking place all the time. The Handbook of Mixture Analysis is a very timely publication, presenting a broad overview of the methods and applications of this important field of research. It covers a wide array of topics, including the EM algorithm, Bayesian mixture models, model-based clustering, high-dimensional data, hidden Markov models, and applications in finance, genomics, and astronomy. Features: Provides a comprehensive overview of the methods and applications of mixture modelling and analysis Divided into three parts: Foundations and Methods; Mixture Modelling and Extensions; and

Selected Applications Contains many worked examples using real data, together with computational implementation, to illustrate the methods described Includes contributions from the leading researchers in the field The Handbook of Mixture Analysis is targeted at graduate students and young researchers new to the field. It will also be an important reference for anyone working in this field, whether they are developing new methodology, or applying the models to real scientific problems.

[Bayesian Modeling and Computation in Python](#) - Osvaldo A. Martin
2021-12-28

Bayesian Modeling and Computation in Python aims to help beginner Bayesian practitioners to become intermediate modelers. It uses a hands on approach with PyMC3, Tensorflow Probability, ArviZ and other libraries focusing on the practice of applied statistics with references to the underlying mathematical theory. The book starts with a refresher of the Bayesian Inference concepts. The second chapter introduces modern methods for Exploratory Analysis of Bayesian Models. With an understanding of these two fundamentals the subsequent chapters talk through various models including linear regressions, splines, time series, Bayesian additive regression trees. The final chapters include Approximate Bayesian Computation, end to end case studies showing how to apply Bayesian modelling in different settings, and a chapter about the internals of probabilistic programming languages. Finally the last chapter serves as a reference for the rest of the book by getting closer into mathematical aspects or by extending the discussion of certain topics. This book is written by contributors of PyMC3, ArviZ, Bambi, and Tensorflow Probability among other libraries.

Towards Global Experimental Design Using Bayesian Networks - Van Anh Phan 2013

Case Studies in Bayesian Statistics - Constantine Gatsonis 1998-12-04
The 4th Workshop on Case Studies in Bayesian Statistics was held at the Carnegie Mellon University campus on September 27-28, 1997. As in the past, the workshop featured both invited and contributed case studies. The former were presented and discussed in detail while the latter were

presented in poster format. This volume contains the four invited case studies with the accompanying discussion as well as nine contributed papers selected by a refereeing process. While most of the case studies in the volume come from biomedical research the reader will also find studies in environmental science and marketing research. INVITED PAPERS In Modeling Customer Survey Data, Linda A. Clark, William S. Cleveland, Lorraine Denby, and Chuanhai LiD use hierarchical modeling with time series components in for customer value analysis (CVA) data from Lucent Technologies. The data were derived from surveys of customers of the company and its competitors, designed to assess relative performance on a spectrum of issues including product and service quality and pricing. The model provides a full description of the CVA data, with random location and scale effects for survey respondents and longitudinal company effects for each attribute. In addition to assessing the performance of specific companies, the model allows the empirical exploration of the conceptual basis of consumer value analysis. The authors place special emphasis on graphical displays for this complex, multivariate set of data and include a wealth of such plots in the paper.

Contemporary Bayesian and Frequentist Statistical Research Methods for Natural Resource Scientists - Howard B. Stauffer
2007-12-14

The first all-inclusive introduction to modern statistical research methods in the natural resource sciences The use of Bayesian statistical analysis has become increasingly important to natural resource scientists as a practical tool for solving various research problems. However, many important contemporary methods of applied statistics, such as generalized linear modeling, mixed-effects modeling, and Bayesian statistical analysis and inference, remain relatively unknown among researchers and practitioners in this field. Through its inclusive, hands-on treatment of real-world examples, Contemporary Bayesian and Frequentist Statistical Research Methods for Natural Resource Scientists successfully introduces the key concepts of statistical analysis and inference with an accessible, easy-to-follow approach. The book provides

case studies illustrating common problems that exist in the natural resource sciences and presents the statistical knowledge and tools needed for a modern treatment of these issues. Subsequent chapter coverage features: An introduction to the fundamental concepts of Bayesian statistical analysis, including its historical background, conjugate solutions, Bayesian hypothesis testing and decision-making, and Markov Chain Monte Carlo solutions The relevant advantages of using Bayesian statistical analysis, rather than the traditional frequentist approach, to address research problems Two alternative strategies—the a posteriori model selection strategy and the a priori parsimonious model selection strategy using AIC and DIC—to model selection and inference The ideas of generalized linear modeling (GLM), focusing on the most popular GLM of logistic regression An introduction to mixed-effects modeling in S-Plus® and R for analyzing natural resource data sets with varying error structures and dependencies Each statistical concept is accompanied by an illustration of its frequentist application in S-Plus® or R as well as its Bayesian application in WinBUGS. Brief introductions to these software packages are also provided to help the reader fully understand the concepts of the statistical methods that are presented throughout the book. Assuming only a minimal background in introductory statistics, Contemporary Bayesian and Frequentist Statistical Research Methods for Natural Resource Scientists is an ideal text for natural resource students studying statistical research methods at the upper-undergraduate or graduate level and also serves as a valuable problem-solving guide for natural resource scientists across a broad range of disciplines, including biology, wildlife management, forestry management, fisheries management, and the environmental sciences.

Bayesian Statistical Modelling - Peter Congdon 2007-04-04

Bayesian methods combine the evidence from the data at hand with previous quantitative knowledge to analyse practical problems in a wide range of areas. The calculations were previously complex, but it is now possible to routinely apply Bayesian methods due to advances in computing technology and the use of new sampling methods for

estimating parameters. Such developments together with the availability of freeware such as WINBUGS and R have facilitated a rapid growth in the use of Bayesian methods, allowing their application in many scientific disciplines, including applied statistics, public health research, medical science, the social sciences and economics. Following the success of the first edition, this reworked and updated book provides an accessible approach to Bayesian computing and analysis, with an emphasis on the principles of prior selection, identification and the interpretation of real data sets. The second edition: Provides an integrated presentation of theory, examples, applications and computer algorithms. Discusses the role of Markov Chain Monte Carlo methods in computing and estimation. Includes a wide range of interdisciplinary applications, and a large selection of worked examples from the health and social sciences. Features a comprehensive range of methodologies and modelling techniques, and examines model fitting in practice using Bayesian principles. Provides exercises designed to help reinforce the reader's knowledge and a supplementary website containing data sets and relevant programs. Bayesian Statistical Modelling is ideal for researchers in applied statistics, medical science, public health and the social sciences, who will benefit greatly from the examples and applications featured. The book will also appeal to graduate students of applied statistics, data analysis and Bayesian methods, and will provide a great source of reference for both researchers and students. Praise for the First Edition: "It is a remarkable achievement to have carried out such a range of analysis on such a range of data sets. I found this book comprehensive and stimulating, and was thoroughly impressed with both the depth and the range of the discussions it contains." - ISI - Short Book Reviews "This is an excellent introductory book on Bayesian modelling techniques and data analysis" - Biometrics "The book fills an important niche in the statistical literature and should be a very valuable resource for students and professionals who are utilizing Bayesian methods." - Journal of Mathematical Psychology

Case Studies in Bayesian Methods for Biopharmaceutical CMC - Paul Faya 2022-12-15

The subject of this book is applied Bayesian methods for chemistry, manufacturing, and control (CMC) studies in the biopharmaceutical industry. The book has multiple authors from industry and academia, each contributing a case study (chapter). The collection of case studies covers a broad array of CMC topics, including stability analysis, analytical method development, specification setting, process development and optimization, process control, experimental design, dissolution testing, and comparability studies. The analysis of each case study includes a presentation of code and reproducible output. This book is written with an academic level aimed at practicing nonclinical biostatisticians, most of whom have graduate degrees in statistics. • First book of its kind focusing strictly on CMC Bayesian case studies • Case studies with code and output • Representation from several companies across the industry as well as academia • Authors are leading and well-known Bayesian statisticians in the CMC field • Accompanying website with code for reproducibility • Reflective of real-life industry applications/problems

Probability and Bayesian Modeling - Jim Albert 2019-12-06

Probability and Bayesian Modeling is an introduction to probability and Bayesian thinking for undergraduate students with a calculus background. The first part of the book provides a broad view of probability including foundations, conditional probability, discrete and continuous distributions, and joint distributions. Statistical inference is presented completely from a Bayesian perspective. The text introduces inference and prediction for a single proportion and a single mean from Normal sampling. After fundamentals of Markov Chain Monte Carlo algorithms are introduced, Bayesian inference is described for hierarchical and regression models including logistic regression. The book presents several case studies motivated by some historical Bayesian studies and the authors' research. This text reflects modern Bayesian statistical practice. Simulation is introduced in all the probability chapters and extensively used in the Bayesian material to simulate from the posterior and predictive distributions. One chapter describes the basic tenets of Metropolis and Gibbs sampling algorithms; however

several chapters introduce the fundamentals of Bayesian inference for conjugate priors to deepen understanding. Strategies for constructing prior distributions are described in situations when one has substantial prior information and for cases where one has weak prior knowledge. One chapter introduces hierarchical Bayesian modeling as a practical way of combining data from different groups. There is an extensive discussion of Bayesian regression models including the construction of informative priors, inference about functions of the parameters of interest, prediction, and model selection. The text uses JAGS (Just Another Gibbs Sampler) as a general-purpose computational method for simulating from posterior distributions for a variety of Bayesian models. An R package ProbBayes is available containing all of the book datasets and special functions for illustrating concepts from the book.

Bayesian Statistics 6 - José M. Bernardo 1999-08-12

Bayesian statistics is a dynamic and fast-growing area of statistical research and the Valencia International Meetings provide the main forum for discussion. These resulting proceedings form an up-to-date collection of research.

Bayesian Statistics and Marketing - Peter E. Rossi 2012-05-14

The past decade has seen a dramatic increase in the use of Bayesian methods in marketing due, in part, to computational and modelling breakthroughs, making its implementation ideal for many marketing problems. Bayesian analyses can now be conducted over a wide range of marketing problems, from new product introduction to pricing, and with a wide variety of different data sources. Bayesian Statistics and Marketing describes the basic advantages of the Bayesian approach, detailing the nature of the computational revolution. Examples contained include household and consumer panel data on product purchases and survey data, demand models based on micro-economic theory and random effect models used to pool data among respondents. The book also discusses the theory and practical use of MCMC methods. Written by the leading experts in the field, this unique book: Presents a unified treatment of Bayesian methods in marketing, with common notation and algorithms for estimating the models. Provides a self-contained

introduction to Bayesian methods. Includes case studies drawn from the authors' recent research to illustrate how Bayesian methods can be extended to apply to many important marketing problems. Is accompanied by an R package, bayesm, which implements all of the models and methods in the book and includes many datasets. In addition the book's website hosts datasets and R code for the case studies. Bayesian Statistics and Marketing provides a platform for researchers in marketing to analyse their data with state-of-the-art methods and develop new models of consumer behaviour. It provides a unified reference for cutting-edge marketing researchers, as well as an invaluable guide to this growing area for both graduate students and professors, alike.

Bayesian Methods for Data Analysis, Third Edition - Bradley P. Carlin 2008-06-30

Broadening its scope to nonstatisticians, Bayesian Methods for Data Analysis, Third Edition provides an accessible introduction to the foundations and applications of Bayesian analysis. Along with a complete reorganization of the material, this edition concentrates more on hierarchical Bayesian modeling as implemented via Markov chain Monte Carlo (MCMC) methods and related data analytic techniques. New to the Third Edition New data examples, corresponding R and WinBUGS code, and homework problems Explicit descriptions and illustrations of hierarchical modeling—now commonplace in Bayesian data analysis A new chapter on Bayesian design that emphasizes Bayesian clinical trials A completely revised and expanded section on ranking and histogram estimation A new case study on infectious disease modeling and the 1918 flu epidemic A solutions manual for qualifying instructors that contains solutions, computer code, and associated output for every homework problem—available both electronically and in print Ideal for Anyone Performing Statistical Analyses Focusing on applications from biostatistics, epidemiology, and medicine, this text builds on the popularity of its predecessors by making it suitable for even more practitioners and students.

Bayesian Modeling and Computation in Python - Osvaldo A. Martin

2021-12-28

Bayesian Modeling and Computation in Python aims to help beginner Bayesian practitioners to become intermediate modelers. It uses a hands on approach with PyMC3, Tensorflow Probability, ArviZ and other libraries focusing on the practice of applied statistics with references to the underlying mathematical theory. The book starts with a refresher of the Bayesian Inference concepts. The second chapter introduces modern methods for Exploratory Analysis of Bayesian Models. With an understanding of these two fundamentals the subsequent chapters talk through various models including linear regressions, splines, time series, Bayesian additive regression trees. The final chapters include Approximate Bayesian Computation, end to end case studies showing how to apply Bayesian modelling in different settings, and a chapter about the internals of probabilistic programming languages. Finally the last chapter serves as a reference for the rest of the book by getting closer into mathematical aspects or by extending the discussion of certain topics. This book is written by contributors of PyMC3, ArviZ, Bambi, and Tensorflow Probability among other libraries.

Case Studies in Bayesian Statistical Modelling and Analysis - Clair L. Alston 2012-10-10

Provides an accessible foundation to Bayesian analysis using real world models This book aims to present an introduction to Bayesian modelling and computation, by considering real case studies drawn from diverse fields spanning ecology, health, genetics and finance. Each chapter comprises a description of the problem, the corresponding model, the computational method, results and inferences as well as the issues that arise in the implementation of these approaches. Case Studies in Bayesian Statistical Modelling and Analysis: Illustrates how to do Bayesian analysis in a clear and concise manner using real-world problems. Each chapter focuses on a real-world problem and describes the way in which the problem may be analysed using Bayesian methods. Features approaches that can be used in a wide area of application, such as, health, the environment, genetics, information science, medicine, biology, industry and remote sensing. Case Studies in

Bayesian Statistical Modelling and Analysis is aimed at statisticians, researchers and practitioners who have some expertise in statistical modelling and analysis, and some understanding of the basics of Bayesian statistics, but little experience in its application. Graduate students of statistics and biostatistics will also find this book beneficial.

Case Studies in Bayesian Statistics - Constantine Gatsonis 1998-12-04

The 4th Workshop on Case Studies in Bayesian Statistics was held at the Carnegie Mellon University campus on September 27-28, 1997. As in the past, the workshop featured both invited and contributed case studies. The former were presented and discussed in detail while the latter were presented in poster format. This volume contains the four invited case studies with the accompanying discussion as well as nine contributed papers selected by a refereeing process. While most of the case studies in the volume come from biomedical research the reader will also find studies in environmental science and marketing research. INVITED PAPERS In Modeling Customer Survey Data, Linda A. Clark, William S. Cleveland, Lorraine Denby, and Chuanhai Li use hierarchical modeling with time series components in for customer value analysis (CVA) data from Lucent Technologies. The data were derived from surveys of customers of the company and its competitors, designed to assess relative performance on a spectrum of issues including product and service quality and pricing. The model provides a full description of the CVA data, with random location and scale effects for survey respondents and longitudinal company effects for each attribute. In addition to assessing the performance of specific companies, the model allows the empirical exploration of the conceptual basis of consumer value analysis. The authors place special emphasis on graphical displays for this complex, multivariate set of data and include a wealth of such plots in the paper.

Case Studies in Bayesian Statistics - Constantine Gatsonis 2012-12-06

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The former were presented and discussed in detail while the latter were presented in poster format. This volume contains the four invited case studies with the accompanying discussion as well as nine contributed papers selected by a refereeing process. While most of the case studies in the volume come from biomedical research the reader will also find studies in environmental science and marketing research. INVITED PAPERS In Modeling Customer Survey Data, Linda A. Clark, William S. Cleveland, Lorraine Denby, and Chuanhai LiD use hierarchical modeling with time series components in for customer value analysis (CVA) data from Lucent Technologies. The data were derived from surveys of customers of the company and its competitors, designed to assess relative performance on a spectrum of issues including product and service quality and pricing. The model provides a full description of the CVA data, with random location and scale effects for survey respondents and longitudinal company effects for each attribute. In addition to assessing the performance of specific companies, the model allows the empirical exploration of the conceptual basis of consumer value analysis. The authors place special emphasis on graphical displays for this complex, multivariate set of data and include a wealth of such plots in the paper.

Bayesian Learning for Neural Networks - Radford M. Neal 2012-12-06 Artificial "neural networks" are widely used as flexible models for classification and regression applications, but questions remain about how the power of these models can be safely exploited when training data is limited. This book demonstrates how Bayesian methods allow complex neural network models to be used without fear of the "overfitting" that can occur with traditional training methods. Insight into the nature of these complex Bayesian models is provided by a theoretical investigation of the priors over functions that underlie them. A practical implementation of Bayesian neural network learning using Markov chain Monte Carlo methods is also described, and software for it is freely available over the Internet. Presupposing only basic knowledge of probability and statistics, this book should be of interest to researchers in statistics, engineering, and artificial intelligence.

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.

Case Studies in Bayesian Statistics, Volume II - Constantine Gatsonis 2012-12-06

Like its predecessor, this second volume presents detailed applications of Bayesian statistical analysis, each of which emphasizes the scientific context of the problems it attempts to solve. The emphasis of this volume is on biomedical applications. These papers were presented at a workshop at Carnegie-Mellon University in 1993.

Case Studies in Bayesian Statistics - Constantine Gatsonis 1993-06-11 The past few years have witnessed dramatic advances in computational methods for Bayesian inference. As a result, Bayesian approaches to

solving a wide variety of problems in data analysis and decision-making have become feasible. The purpose of this volume is to present several detailed examples of applications of Bayesian methods. The emphasis of each article is on the scientific or technological context of the problem being solved, and much background material is provided to complete the description of the analysis. This collection illustrates the ways in which Bayesian methods are permeating statistical practice. Noteworthy in the articles are the construction of explicit and conceptually simple models, the use of information other than the data under analysis, and the representation of uncertainty from various sources in the model. Consequently, many researchers will find this collection an illuminating survey of Bayesian methods in practice, and both lecturers and students will be able to learn a great deal through study of these examples.

Empirical Bayes and Likelihood Inference - S.E. Ahmed 2001
Bayesian and such approaches to inference have a number of points of close contact, especially from an asymptotic point of view. Both emphasize the construction of interval estimates of unknown parameters. In this volume, researchers present recent work on several aspects of Bayesian, likelihood and empirical Bayes methods, presented at a workshop held in Montreal, Canada. The goal of the workshop was to explore the linkages among the methods, and to suggest new directions for research in the theory of inference.

Case Studies in Environmental Statistics - Douglas Nychka 2012-12-06
This book offers a set of case studies exemplifying the broad range of statistical science used in environmental studies and application. The case studies can be used for graduate courses in environmental statistics, as a resource for courses in statistics using genuine examples to illustrate statistical methodology and theory, and for courses in environmental science. Not only are these studies valuable for teaching about an essential cross-disciplinary activity but they can also be used to spur new research along directions exposed in these examples. The studies reported here resulted from a program of research carried on by the National Institute of Statistical Sciences (NISS) during the years 1992- 1996. NISS was created in 1991 as an initiative of the national

statistics organizations, with the mission to renew and focus efforts of statistical science on important cross-disciplinary problems. One of NISS' first projects was a cooperative research effort with the U.S. Environmental Protection Agency (EPA) on problems of great interest to environmental science and regulation, surely one of today's most important cross-disciplinary activities. With the support and encouragement of Gary Foley, Director of the (then) U.S. EPA Atmospheric Research and Exposure Assessment Laboratory, a project and a research team were assembled by NISS that pursued a program which produced a set of results and products from which this book was drawn.

Missing Data in Longitudinal Studies - Michael J. Daniels 2008-03-11
Drawing from the authors' own work and from the most recent developments in the field, *Missing Data in Longitudinal Studies: Strategies for Bayesian Modeling and Sensitivity Analysis* describes a comprehensive Bayesian approach for drawing inference from incomplete data in longitudinal studies. To illustrate these methods, the authors employ several data sets throughout that cover a range of study designs, variable types, and missing data issues. The book first reviews modern approaches to formulate and interpret regression models for longitudinal data. It then discusses key ideas in Bayesian inference, including specifying prior distributions, computing posterior distribution, and assessing model fit. The book carefully describes the assumptions needed to make inferences about a full-data distribution from incompletely observed data. For settings with ignorable dropout, it emphasizes the importance of covariance models for inference about the mean while for nonignorable dropout, the book studies a variety of models in detail. It concludes with three case studies that highlight important features of the Bayesian approach for handling nonignorable missingness. With suggestions for further reading at the end of most chapters as well as many applications to the health sciences, this resource offers a unified Bayesian approach to handle missing data in longitudinal studies.

Case Studies in Bayesian Statistics - Constantine Gatsonis 2018-08-17

This volume contains invited case studies with the accompanying discussion as well as contributed papers selected by a refereeing process of 6th Workshop on Case Studies in Bayesian Statistics was held at the Carnegie Mellon University in October, 2001.

MODA4 — Advances in Model-Oriented Data Analysis - Christos P. Kitsos 2013-06-29

This volume is the proceedings of the 4th International Workshop on Model-Oriented Data Analysis. This series of events originated in 1987 at a meeting in Eisenach, that successfully brought together scientists from numerous countries of the 'East ' and 'West'. Now that this distinction is obsolete dialogue has been greatly facilitated, providing opportunities for this dialogue, however, is as vital as ever. The present meeting at Spetses, Greece from 5th to 9th of June 1995 again assembles statisticians from all over the world as this book documents. The hospitality offered by the University of Economics of Athens and the Korgialenios School made it possible to organize this workshop. The editors are also grateful to Intracom (Greece), the Ionian Bank and the Procter & Gamble Company (USA) for their generous support. We would particularly like to mention Dr. Michael Meredith, who being our contact person at Procter & Gamble, enabled us to publish these proceedings. Further thanks go to Dr. Peter Schuster from Physica Verlag Heidelberg for his continuing support of the project. The contributions to this volume were carefully selected from the submissions by the editors after a one stage refereeing process. We would like to thank the members of the MODA committee, A.C. Atkinson, R.D. Cook, V.V. Fedorov, P.Hackl, H. Lauter, B.Torsney, LN. Vuchkov, H.P.Wynn, and A.A. Zhigljavsky, who not only defined the main topics of the workshop, but also served as the referees.

Missing Data in Longitudinal Studies - Michael J. Daniels 2008-03-11
Drawing from the authors' own work and from the most recent developments in the field, *Missing Data in Longitudinal Studies: Strategies for Bayesian Modeling and Sensitivity Analysis* describes a comprehensive Bayesian approach for drawing inference from incomplete data in longitudinal studies. To illustrate these methods, the

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A First Course in Bayesian Statistical Methods - Peter D. Hoff 2009-06-02
A self-contained introduction to probability, exchangeability and Bayes' rule provides a theoretical understanding of the applied material. Numerous examples with R-code that can be run "as-is" allow the reader to perform the data analyses themselves. The development of Monte Carlo and Markov chain Monte Carlo methods in the context of data analysis examples provides motivation for these computational methods.
Modeling in Medical Decision Making - Giovanni Parmigiani 2002-03-01
Medical decision making has evolved in recent years, as more complex problems are being faced and addressed based on increasingly large amounts of data. In parallel, advances in computing have led to a host of new and powerful statistical tools to support decision making. Simulation-based Bayesian methods are especially promising, as they provide a unified framework for data collection, inference, and decision making. In addition, these methods are simple to interpret, and can help to address the most pressing practical and ethical concerns arising in medical decision making. * Provides an overview of the necessary methodological background, including Bayesian inference, Monte Carlo

simulation, and utility theory. * Driven by three real applications, presented as extensively detailed case studies. * Case studies include simplified versions of the analysis, to approach complex modelling in stages. * Features coverage of meta-analysis, decision analysis, and comprehensive decision modeling. * Accessible to readers with only a basic statistical knowledge. Primarily aimed at students and practitioners of biostatistics, the book will also appeal to those working in statistics, medical informatics, evidence-based medicine, health economics, health services research, and health policy.

Case Studies in Applied Bayesian Data Science - Kerrie L. Mengersen 2020-05-28

Presenting a range of substantive applied problems within Bayesian Statistics along with their Bayesian solutions, this book arises from a research program at CIRM in France in the second semester of 2018, which supported Kerrie Mengersen as a visiting Jean-Morlet Chair and Pierre Pudlo as the local Research Professor. The field of Bayesian statistics has exploded over the past thirty years and is now an established field of research in mathematical statistics and computer science, a key component of data science, and an underpinning methodology in many domains of science, business and social science. Moreover, while remaining naturally entwined, the three arms of Bayesian statistics, namely modelling, computation and inference, have grown into independent research fields. While the research arms of Bayesian statistics continue to grow in many directions, they are harnessed when attention turns to solving substantive applied problems. Each such problem set has its own challenges and hence draws from the suite of research a bespoke solution. The book will be useful for both theoretical and applied statisticians, as well as practitioners, to inspect these solutions in the context of the problems, in order to draw further understanding, awareness and inspiration.

Applied Data Mining - Paolo Giudici 2005-09-27

Data mining can be defined as the process of selection, exploration and modelling of large databases, in order to discover models and patterns. The increasing availability of data in the current information society has

led to the need for valid tools for its modelling and analysis. Data mining and applied statistical methods are the appropriate tools to extract such knowledge from data. Applications occur in many different fields, including statistics, computer science, machine learning, economics, marketing and finance. This book is the first to describe applied data mining methods in a consistent statistical framework, and then show how they can be applied in practice. All the methods described are either computational, or of a statistical modelling nature.

Complex probabilistic models and mathematical tools are not used, so the book is accessible to a wide audience of students and industry professionals. The second half of the book consists of nine case studies, taken from the author's own work in industry, that demonstrate how the methods described can be applied to real problems. Provides a solid introduction to applied data mining methods in a consistent statistical framework. Includes coverage of classical, multivariate and Bayesian statistical methodology. Includes many recent developments such as web mining, sequential Bayesian analysis and memory based reasoning. Each statistical method described is illustrated with real life applications. Features a number of detailed case studies based on applied projects within industry. Incorporates discussion on software used in data mining, with particular emphasis on SAS. Supported by a website featuring data sets, software and additional material. Includes an extensive bibliography and pointers to further reading within the text. Author has many years experience teaching introductory and multivariate statistics and data mining, and working on applied projects within industry. A valuable resource for advanced undergraduate and graduate students of applied statistics, data mining, computer science and economics, as well as for professionals working in industry on projects involving large volumes of data - such as in marketing or financial risk management.

Applied Data Mining for Business and Industry - Paolo Giudici 2009-05-26

The increasing availability of data in our current, information overloaded society has led to the need for valid tools for its modelling and analysis.

Data mining and applied statistical methods are the appropriate tools to extract knowledge from such data. This book provides an accessible introduction to data mining methods in a consistent and application oriented statistical framework, using case studies drawn from real industry projects and highlighting the use of data mining methods in a variety of business applications. Introduces data mining methods and applications. Covers classical and Bayesian multivariate statistical methodology as well as machine learning and computational data mining methods. Includes many recent developments such as association and sequence rules, graphical Markov models, lifetime value modelling, credit risk, operational risk and web mining. Features detailed case studies based on applied projects within industry. Incorporates discussion of data mining software, with case studies analysed using R. Is accessible to anyone with a basic knowledge of statistics or data analysis. Includes an extensive bibliography and pointers to further reading within the text. Applied Data Mining for Business and Industry, 2nd edition is aimed at advanced undergraduate and graduate students of data mining, applied statistics, database management, computer science and economics. The case studies will provide guidance to professionals working in industry on projects involving large volumes of data, such as customer relationship management, web design, risk management, marketing, economics and finance.

Practical Nonparametric and Semiparametric Bayesian Statistics - Dipak D. Dey 2012-12-06

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

Introduction to Hierarchical Bayesian Modeling for Ecological Data - Eric Parent 2012-08-21

Making statistical modeling and inference more accessible to ecologists

and related scientists, Introduction to Hierarchical Bayesian Modeling for Ecological Data gives readers a flexible and effective framework to learn about complex ecological processes from various sources of data. It also helps readers get started on building their own statistical models. The text begins with simple models that progressively become more complex and realistic through explanatory covariates and intermediate hidden states variables. When fitting the models to data, the authors gradually present the concepts and techniques of the Bayesian paradigm from a practical point of view using real case studies. They emphasize how hierarchical Bayesian modeling supports multidimensional models involving complex interactions between parameters and latent variables. Data sets, exercises, and R and WinBUGS codes are available on the authors' website. This book shows how Bayesian statistical modeling provides an intuitive way to organize data, test ideas, investigate competing hypotheses, and assess degrees of confidence of predictions. It also illustrates how conditional reasoning can dismantle a complex reality into more understandable pieces. As conditional reasoning is intimately linked with Bayesian thinking, considering hierarchical models within the Bayesian setting offers a unified and coherent framework for modeling, estimation, and prediction.

Complex Data Modeling and Computationally Intensive Statistical Methods - Pietro Mantovan 2011-01-27

Selected from the conference "S.Co.2009: Complex Data Modeling and Computationally Intensive Methods for Estimation and Prediction," these 20 papers cover the latest in statistical methods and computational techniques for complex and high dimensional datasets.

Bayes Rules! - Alicia A. Johnson 2022-03-03

Praise for Bayes Rules!: An Introduction to Applied Bayesian Modeling "A thoughtful and entertaining book, and a great way to get started with Bayesian analysis." Andrew Gelman, Columbia University "The examples are modern, and even many frequentist intro books ignore important topics (like the great p-value debate) that the authors address. The focus on simulation for understanding is excellent." Amy Herring, Duke University "I sincerely believe that a generation of students will cite this

book as inspiration for their use of – and love for – Bayesian statistics. The narrative holds the reader’s attention and flows naturally – almost conversationally. Put simply, this is perhaps the most engaging introductory statistics textbook I have ever read. [It] is a natural choice for an introductory undergraduate course in applied Bayesian statistics.” Yue Jiang, Duke University “This is by far the best book I’ve seen on how to (and how to teach students to) do Bayesian modeling and understand the underlying mathematics and computation. The authors build intuition and scaffold ideas expertly, using interesting real case studies, insightful graphics, and clear explanations. The scope of this book is vast – from basic building blocks to hierarchical modeling, but the authors’ thoughtful organization allows the reader to navigate this journey smoothly. And impressively, by the end of the book, one can run sophisticated Bayesian models and actually understand the whys, whats, and hows.” Paul Roback, St. Olaf College “The authors provide a compelling, integrated, accessible, and non-religious introduction to statistical modeling using a Bayesian approach. They outline a principled approach that features computational implementations and model assessment with ethical implications interwoven throughout. Students and instructors will find the conceptual and computational exercises to be fresh and engaging.” Nicholas Horton, Amherst College An engaging, sophisticated, and fun introduction to the field of Bayesian statistics, *Bayes Rules!: An Introduction to Applied Bayesian Modeling* brings the power of modern Bayesian thinking, modeling, and computing to a broad audience. In particular, the book is an ideal resource for advanced undergraduate statistics students and practitioners with comparable experience. *Bayes Rules!* empowers readers to weave Bayesian approaches into their everyday practice. Discussions and applications are data driven. A natural progression from fundamental to multivariable, hierarchical models emphasizes a practical and generalizable model building process. The evaluation of these Bayesian models reflects the fact that a data analysis does not exist in a vacuum. Features

- Utilizes data-driven examples and exercises.
- Emphasizes the iterative model building and evaluation process.
- Surveys an interconnected range of

- multivariable regression and classification models.
- Presents fundamental Markov chain Monte Carlo simulation.
- Integrates R code, including RStan modeling tools and the bayesrules package.
- Encourages readers to tap into their intuition and learn by doing.
- Provides a friendly and inclusive introduction to technical Bayesian concepts.
- Supports Bayesian applications with foundational Bayesian theory.

Bayesian Biostatistics - Emmanuel Lesaffre 2012-06-18

The growth of biostatistics has been phenomenal in recent years and has been marked by considerable technical innovation in both methodology and computational practicality. One area that has experienced significant growth is Bayesian methods. The growing use of Bayesian methodology has taken place partly due to an increasing number of practitioners valuing the Bayesian paradigm as matching that of scientific discovery. In addition, computational advances have allowed for more complex models to be fitted routinely to realistic data sets. Through examples, exercises and a combination of introductory and more advanced chapters, this book provides an invaluable understanding of the complex world of biomedical statistics illustrated via a diverse range of applications taken from epidemiology, exploratory clinical studies, health promotion studies, image analysis and clinical trials. Key Features:

- Provides an authoritative account of Bayesian methodology, from its most basic elements to its practical implementation, with an emphasis on healthcare techniques. Contains introductory explanations of Bayesian principles common to all areas of application. Presents clear and concise examples in biostatistics applications such as clinical trials, longitudinal studies, bioassay, survival, image analysis and bioinformatics. Illustrated throughout with examples using software including WinBUGS, OpenBUGS, SAS and various dedicated R programs. Highlights the differences between the Bayesian and classical approaches. Supported by an accompanying website hosting free software and case study guides. *Bayesian Biostatistics* introduces the reader smoothly into the Bayesian statistical methods with chapters that gradually increase in level of complexity. Master students in biostatistics, applied statisticians

and all researchers with a good background in classical statistics who have interest in Bayesian methods will find this book useful.

Case Studies in Bayesian Statistics - Constantine Gatsonis 2012-12-06

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

Applied Bayesian Modelling - Peter Congdon 2003-04-18

The use of Bayesian statistics has grown significantly in recent years, and will undoubtedly continue to do so. Applied Bayesian Modelling is the follow-up to the author's best selling book, Bayesian Statistical Modelling, and focuses on the potential applications of Bayesian techniques in a wide range of important topics in the social and health sciences. The applications are illustrated through many real-life examples and software implementation in WINBUGS - a popular software package that offers a simplified and flexible approach to statistical modelling. The book gives detailed explanations for each example - explaining fully the choice of model for each particular problem. The book · Provides a broad and comprehensive account of applied Bayesian modelling. · Describes a variety of model assessment methods and the flexibility of Bayesian prior specifications. · Covers many application areas, including panel data models, structural equation and other multivariate structure models, spatial analysis, survival analysis and epidemiology. · Provides detailed worked examples in WINBUGS to illustrate the practical application of the techniques described. All WINBUGS programs are available from an ftp site. The book provides a good introduction to Bayesian modelling and data analysis for a wide range of people involved in applied statistical analysis, including researchers and students from statistics, and the health and social sciences. The wealth of examples makes this book an ideal reference for anyone involved in statistical modelling and analysis.

Bayesian Analysis with R for Drug Development - Harry Yang

2019-06-26

Drug development is an iterative process. The recent publications of regulatory guidelines further entail a lifecycle approach. Blending data from disparate sources, the Bayesian approach provides a flexible framework for drug development. Despite its advantages, the uptake of Bayesian methodologies is lagging behind in the field of pharmaceutical development. Written specifically for pharmaceutical practitioners, Bayesian Analysis with R for Drug Development: Concepts, Algorithms, and Case Studies, describes a wide range of Bayesian applications to problems throughout pre-clinical, clinical, and Chemistry, Manufacturing, and Control (CMC) development. Authored by two seasoned statisticians in the pharmaceutical industry, the book provides detailed Bayesian solutions to a broad array of pharmaceutical problems. Features Provides a single source of information on Bayesian statistics for drug development Covers a wide spectrum of pre-clinical, clinical, and CMC topics Demonstrates proper Bayesian applications using real-life examples Includes easy-to-follow R code with Bayesian Markov Chain Monte Carlo performed in both JAGS and Stan Bayesian software platforms Offers sufficient background for each problem and detailed description of solutions suitable for practitioners with limited Bayesian knowledge Harry Yang, Ph.D., is Senior Director and Head of Statistical Sciences at AstraZeneca. He has 24 years of experience across all aspects of drug research and development and extensive global regulatory experiences. He has published 6 statistical books, 15 book chapters, and over 90 peer-reviewed papers on diverse scientific and statistical subjects, including 15 joint statistical works with Dr. Novick. He is a frequent invited speaker at national and international conferences. He also developed statistical courses and conducted training at the FDA and USP as well as Peking University. Steven Novick, Ph.D., is Director of Statistical Sciences at AstraZeneca. He has extensively contributed statistical methods to the biopharmaceutical literature. Novick is a skilled Bayesian computer programmer and is frequently invited to speak at conferences, having developed and taught

courses in several areas, including drug-combination analysis and

Bayesian methods in clinical areas. Novick served on IPAC-RS and has chaired several national statistical conferences.