Applied Bayesian Statistics With R And Openbugs Examples Springer Texts In Statistics

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Computational Bayesian Statistics - M. Antónia Amaral Turkman 2019-02-28 This integrated introduction to fundamentals, computation, and software is your key to understanding and using advanced Bayesian methods.

Bayesian Models for Astrophysical Data - Joseph M. Hilbe 2017-04-27 A hands-on guide to Bayesian models with R, JAGS, Python, and Stan code, for a wide range of astronomical data types.

Bayesian Population Analysis using WinBUGS - Marc Kery 2011-10-11 Bayesian statistics has exploded into biology and its sub-disciplines, such as ecology, over the past decade. The free software program WinBUGS, and its open-source sister OpenBugs, is currently the only flexible and general-purpose program available with which the average ecologist can conduct standard and non-standard Bayesian statistics. Comprehensive and richly commented examples illustrate a wide range of models that are most relevant to the research of a modern population ecologist All WinBUGS/OpenBUGS analyses are completely integrated in software R Includes complete documentation of all R and WinBUGS code required to conduct analyses and shows all the necessary steps from having the data in a text file out of Excel to interpreting and processing the output from WinBUGS in R

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.

Doing Bayesian Data Analysis - John Kruschke 2014-11-11
Doing Bayesian Data Analysis: A Tutorial with R, JAGS, and Stan, Second Edition provides an accessible approach for conducting Bayesian data analysis, as material is explained clearly with concrete examples. Included are step-by-step instructions on how to carry out Bayesian data analyses in the popular and free software R and WinBugs, as well as new programs in JAGS and Stan. The new programs are designed to be much easier to use than the scripts in the first edition. In particular, there are now compact high-level scripts that make it easy to run the programs on your own data sets. The book is divided into three parts and begins with the basics: models, probability, Bayes' rule, and the

R programming language. The discussion then moves to the fundamentals applied to inferring a binomial probability, before concluding with chapters on the generalized linear model. Topics include metric-predicted variable on one or two groups; metric-predicted variable with one metric predictor; metric-predicted variable with multiple metric predictors; metric-predicted variable with one nominal predictor; and metric-predicted variable with multiple nominal predictors. The exercises found in the text have explicit purposes and guidelines for accomplishment. This book is intended for first-year graduate students or advanced undergraduates in statistics, data analysis, psychology, cognitive science, social sciences, clinical sciences, and consumer sciences in business. Accessible, including the basics of essential concepts of probability and random sampling Examples with R programming language and JAGS software Comprehensive coverage of all scenarios addressed by non-Bayesian textbooks: t-tests, analysis of variance (ANOVA) and comparisons in ANOVA, multiple regression, and chi-square (contingency table analysis) Coverage of experiment planning R and JAGS computer programming code on website Exercises have explicit purposes and guidelines for accomplishment Provides step-by-step instructions on how to conduct Bayesian data analyses in the popular and free software R and WinBugs

Ocular Fluid Dynamics - Giovanna Guidoboni 2019-11-25
The chapters in this contributed volume showcase current theoretical approaches in the modeling of ocular fluid dynamics in health and disease. By including chapters written by experts from a variety of fields, this volume will help foster a genuinely collaborative spirit between clinical and research scientists. It vividly illustrates the advantages of clinical and experimental methods, data-driven modeling, and physically-based modeling, while also

detailing the limitations of each approach. Blood, aqueous humor, vitreous humor, tear film, and cerebrospinal fluid each have a section dedicated to their anatomy and physiology, pathological conditions, imaging techniques, and mathematical modeling. Because each fluid receives a thorough analysis from experts in their respective fields, this volume stands out among the existing ophthalmology literature. Ocular Fluid Dynamics is ideal for current and future graduate students in applied mathematics and ophthalmology who wish to explore the field by investigating open questions, experimental technologies, and mathematical models. It will also be a valuable resource for researchers in mathematics, engineering, physics, computer science, chemistry, ophthalmology, and more. 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.

Introduction to Bayesian Statistics - William M. Bolstad 2016-09-02

"...this edition is useful and effective in teaching Bayesian inference at both elementary and intermediate levels. It is a well-written book on elementary Bayesian inference, and the material is easily accessible. It is both concise and timely, and provides a good collection of overviews and reviews of important tools used in Bayesian statistical methods." There is a strong upsurge in the use of Bayesian methods in applied statistical analysis, yet most introductory statistics texts only present frequentist methods. Bayesian statistics has many important advantages that students should learn about if they are going into fields where statistics will be used. In this third Edition, four newly-added chapters address topics that reflect the rapid advances in the field of Bayesian statistics. The authors continue to provide a Bayesian treatment of introductory statistical topics, such as scientific data gathering, discrete random variables, robust Bayesian methods, and Bayesian approaches to inference for discrete random variables, binomial proportions, Poisson, and normal means, and simple linear regression. In addition, more advanced topics in the field are presented in four new chapters: Bayesian inference for a normal with unknown mean and variance; Bayesian inference for a Multivariate Normal mean vector; Bayesian inference for the Multiple Linear Regression Model; and Computational Bayesian Statistics including

Markov Chain Monte Carlo. The inclusion of these topics will facilitate readers' ability to advance from a minimal understanding of Statistics to the ability to tackle topics in more applied, advanced level books. Minitab macros and R functions are available on the book's related website to assist with chapter exercises. Introduction to Bayesian Statistics, Third Edition also features: Topics including the Joint Likelihood function and inference using independent Jeffreys priors and join conjugate prior The cutting-edge topic of computational Bayesian Statistics in a new chapter, with a unique focus on Markov Chain Monte Carlo methods Exercises throughout the book that have been updated to reflect new applications and the latest software applications Detailed appendices that guide readers through the use of R and Minitab software for Bayesian analysis and Monte Carlo simulations, with all related macros available on the book's website Introduction to Bayesian Statistics, Third Edition is a textbook for upper-undergraduate or first-year graduate level courses on introductory statistics course with a Bayesian emphasis. It can also be used as a reference work for statisticians who require a working knowledge of Bayesian statistics.

Applied Bayesian Hierarchical Methods - Peter D. Congdon 2010-05-19
The use of Markov chain Monte Carlo (MCMC) methods for estimating hierarchical models involves complex data structures and is often described as a revolutionary development. An intermediate-level treatment of Bayesian hierarchical models and their applications, Applied Bayesian Hierarchical Methods demonstrates the advantages of a Bayesian approach to data sets involving inferences for collections of related units or variables and in methods where parameters can be treated as random collections. Emphasizing computational issues, the book provides examples of the following application settings: meta-analysis,

data structured in space or time, multilevel and longitudinal data, multivariate data, nonlinear regression, and survival time data. For the worked examples, the text mainly employs the WinBUGS package, allowing readers to explore alternative likelihood assumptions, regression structures, and assumptions on prior densities. It also incorporates BayesX code, which is particularly useful in nonlinear regression. To demonstrate MCMC sampling from first principles, the author includes worked examples using the R package. Through illustrative data analysis and attention to statistical computing, this book focuses on the practical implementation of Bayesian hierarchical methods. It also discusses several issues that arise when applying Bayesian techniques in hierarchical and random effects models.

Bayesian Core: A Practical Approach to Computational Bayesian Statistics - Jean-Michel Marin 2007-05-26
This Bayesian modeling book is intended for practitioners and applied statisticians looking for a self-contained entry to computational Bayesian statistics. Focusing on standard statistical models and backed up by discussed real datasets available from the book website, it provides an operational methodology for conducting Bayesian inference, rather than focusing on its theoretical justifications. Special attention is paid to the derivation of prior distributions in each case and specific reference solutions are given for each of the models. Similarly, computational details are worked out to lead the reader towards an effective programming of the methods given in the book.

Introduction to WinBUGS for Ecologists - Marc Kery 2010-07-19
Introduction to WinBUGS for Ecologists introduces applied Bayesian modeling to ecologists using the highly acclaimed, free WinBUGS software. It offers an understanding of statistical models as abstract representations of the various processes that give rise to a data set.

Such an understanding is basic to the development of inference models tailored to specific sampling and ecological scenarios. The book begins by presenting the advantages of a Bayesian approach to statistics and introducing the WinBUGS software. It reviews the four most common statistical distributions: the normal, the uniform, the binomial, and the Poisson. It describes the two different kinds of analysis of variance (ANOVA): one-way and two- or multiway. It looks at the general linear model, or ANCOVA, in R and WinBUGS. It introduces generalized linear model (GLM), i.e., the extension of the normal linear model to allow error distributions other than the normal. The GLM is then extended contain additional sources of random variation to become a generalized linear mixed model (GLMM) for a Poisson example and for a binomial example. The final two chapters showcase two fairly novel and nonstandard versions of a GLMM. The first is the site-occupancy model for species distributions;

the second is the binomial (or N-) mixture model for estimation and modeling of abundance. Introduction to the essential theories of key models used by ecologists Complete juxtaposition of classical analyses in R and Bayesian analysis of the same models in WinBUGS Provides every detail of R and WinBUGS code required to conduct all analyses Companion Web Appendix that contains all code contained in the book and additional material (including more code and solutions to exercises)
Bayesian Analysis Made Simple - Phil Woodward 2016-04-19
Although the popularity of the Bayesian approach to statistics has been growing for years, many still think of it as somewhat esoteric, not focused on practical issues, or generally too difficult to understand. Bayesian Analysis Made Simple is aimed at those who wish to apply Bayesian methods but either are not experts or do not have the time to create WinBUGS code and ancillary files for every

analysis they undertake. Accessible to even those who would not routinely use Excel, this book provides a custom-made Excel GUI, immediately useful to those users who want to be able to quickly apply Bayesian methods without being distracted by computing or mathematical issues. From simple NLMs to complex GLMMs and beyond, Bayesian Analysis Made Simple describes how to use Excel for a vast range of Bayesian models in an intuitive manner accessible to the statistically savvy user. Packed with relevant case studies, this book is for any data analyst wishing to apply Bayesian methods to analyze their data, from professional statisticians to statistically aware scientists.
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 the latest methodology and recent changes in software offerings. New to the Second Edition Two chapters on Markov chain Monte Carlo (MCMC) that cover ergodicity, convergence, mixing, simulated annealing, reversible jump MCMC, and coupling Expanded coverage of Bayesian linear and hierarchical models More technical and philosophical details on prior distributions A dedicated R package (BaM) with data and code for the examples as well as a set of functions for practical purposes such as calculating highest posterior density (HPD) intervals Requiring only a basic working knowledge of linear algebra and calculus, this text is one of the few to offer a graduate-level introduction to Bayesian statistics for social scientists. It first introduces Bayesian statistics and inference, before moving on to assess model quality and fit. Subsequent chapters examine hierarchical models within a Bayesian context and explore MCMC techniques

and other numerical methods. Concentrating on practical computing issues, the author includes specific details for Bayesian model building and testing and uses the R and BUGS software for examples and exercises.

Applied Bayesian Modelling - Peter Congdon 2014-07-14
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.
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

Bayesian Data Analysis in Ecology Using Linear Models with R, BUGS, and Stan - Franzi Korner-Nievergelt 2015-04-04 Bayesian Data Analysis in Ecology Using Linear Models with R, BUGS, and STAN examines the Bayesian and frequentist methods of conducting

data analyses. The book provides the theoretical background in an easy-to-understand approach, encouraging readers to examine the processes that generated their data. Including discussions of model selection, model checking, and multi-model inference, the book also uses effect plots that allow a natural interpretation of data. Bayesian Data Analysis in Ecology Using Linear Models with R, BUGS, and STAN introduces Bayesian software, using R for the simple modes, and flexible Bayesian software (BUGS and Stan) for the more complicated ones. Guiding the ready from easy toward more complex (real) data analyses ina step-by-step manner, the book presents problems and solutions—including all R codes—that are most often applicable to other data and questions, making it an invaluable resource for analyzing a variety of data types. Introduces Bayesian data analysis, allowing users to obtain uncertainty measurements easily for any derived parameter of interest Written in a step-by-step approach that allows for eased understanding by non-statisticians Includes a companion website containing R-code to help users conduct Bayesian data analyses on their own data All example data as well as additional functions are provided in the R-package blmeco **The BUGS Book** - David Lunn 2012-10-02 Bayesian statistical methods have become widely used for data analysis and modelling in recent years, and the BUGS software has become the most popular software for Bayesian analysis worldwide. Authored by the team that originally developed this software, The BUGS Book provides a practical introduction to this program and its use. The text presents complete coverage of all the functionalities of BUGS, including prediction, missing data, model criticism, and prior sensitivity. It also features a large number of worked examples and a wide range of applications from various disciplines. The book introduces regression models, techniques for criticism and comparison, and a wide range of modelling issues before going into the vital area

of hierarchical models, one of the most common applications of Bayesian methods. It deals with essentials of modelling without getting bogged down in complexity. The book emphasises model criticism, model comparison, sensitivity analysis to alternative priors, and thoughtful choice of prior distributions—all those aspects of the "art" of modelling that are easily overlooked in more theoretical expositions. More pragmatic than ideological, the authors systematically work through the large range of "tricks" that reveal the real power of the BUGS software, for example, dealing with missing data, censoring, grouped data, prediction, ranking, parameter constraints, and so on. Many of the examples are biostatistical, but they do not require domain knowledge and are generalisable to a wide range of other application areas. Full code and data for examples, exercises, and some solutions can be found on the book's website.

Introduction to Applied Bayesian Statistics and Estimation for Social Scientists - Scott M. Lynch 2007-06-30

This book outlines Bayesian statistical analysis in great detail, from the development of a model through the process of making statistical inference. The key feature of this book is that it covers models that are most commonly used in social science research - including the linear regression model, generalized linear models, hierarchical models, and multivariate regression models - and it thoroughly develops each real-data example in painstaking detail.

The mindsponge and BMF analytics for innovative thinking in social sciences and humanities - Quan-Hoang Vuong 2022-10-10 Academia is a competitive environment. Early Career Researchers (ECRs) are limited in experience and resources and especially need achievements to secure and expand their careers. To help with these issues, this book offers a new approach for conducting research using the combination of mindsponge innovative thinking and Bayesian analytics. This is not just

another analytics book. 1. A new perspective on psychological processes: Mindsponge is a novel approach for examining the human mind's information processing mechanism. This conceptual framework is used to construct models in studies. The framework is highly flexible and widely applicable for many different types of information processes. The mindsponge approach can help researchers discover interesting ideas or even formulate their very own theories when investigating psychosocial phenomena. This approach brings a fresh wind to the current landscape of social sciences and humanities (SSH). 2. Easy-to-follow analysis protocol: The Bayesian Mindsponge Framework (BMF analytics) is useful in terms of computing and visualizing power but also easy to learn and apply. Contrary to being intimidating, the Bayesian analytics section of this book is presented in a reader-friendly manner with a detailed yet clear step-by-step procedure. Examples are from published BMF articles, allowing readers to immediately practice the method and quickly create their own applications. With educational purposes in mind, the book is very suitable for ECRs who are looking to innovate their research methods. 3. Advocating for low-cost, high-quality research: Doing science can be very costly. Mindsponge innovative thinking and BMF analytics help produce impactful studies using openly available data on online repositories. This is based on the authors' previous works and experiences. The book presents examples of employing the open R package bayesvl on secondary data from different sources. With less financial constraints, researchers can have more freedom of thought to pursue their curiosity and creativity. ECRs in low- and middle-income countries may find this aspect crucial in their careers. 4. Support and collaboration: The authors share their insights from experiences in the academic publishing system to help readers get through the processes of manuscript writing and peer-

reviewing more easily. The authors are also ready to support other researchers with further inquiries and collaboration opportunities at the following website, https://mindsponge.info. This book is for: a) ECRs whose only abundant resources are their innovation capacity and strength of will; b) Researchers in SSH who want to explore a novel approach to thinking and study conducting; c) Low- and middle-income countries' researchers looking for a cost-effective research protocol; and, d) Innovative thinkers who want to turn their interesting thoughts into good publications.

Bayesian Statistics the Fun Way - Will Kurt 2019-07-16

Fun guide to learning Bayesian statistics and probability through unusual and illustrative examples. Probability and statistics are increasingly important in a huge range of professions. But many people use data in ways they don't even understand, meaning they aren't getting the most from it. Bayesian Statistics the Fun Way will change that. This book will give you a complete understanding of Bayesian statistics through simple explanations and un-boring examples. Find out the probability of UFOs landing in your garden, how likely Han Solo is to survive a flight through an asteroid shower, how to win an argument about conspiracy theories, and whether a burglary really was a burglary, to name a few examples. By using these off-the-beaten-track examples, the author actually makes learning statistics fun. And you'll learn real skills, like how to: - How to measure your own level of uncertainty in a conclusion or belief - Calculate Bayes theorem and understand what it's useful for - Find the posterior, likelihood, and prior to check the accuracy of your conclusions - Calculate distributions to see the range of your data - Compare hypotheses and draw reliable conclusions from them Next time you find yourself with a sheaf of survey results and no idea what to do with them, turn to Bayesian

Statistics the Fun Way to get the most value from your data.

Bayesian Computation with R - Jim Albert 2007 There has been a dramatic growth in the development and application of Bayesian inferential methods. Some of this growth is due to the availability of powerful simulation-based algorithms to summarize posterior distributions. There has been also a growing interest in the use of the system R for statistical analyses. R's open source nature, free availability, and large number of contributor packages have made R the software of choice for many statisticians in education and industry.Bayesian Computation with R introduces Bayesian modeling by the use of computation using the R language. The early chapters present the basic tenets of Bayesian thinking by use of familiar one and two-parameter inferential problems. Bayesian computational methods such as Laplace's method, rejection sampling, and the SIR algorithm are illustrated in the context of a random effects model. The construction and implementation of Markov Chain Monte Carlo (MCMC) methods is introduced. These simulation-based algorithms are implemented for a variety of Bayesian applications such as normal and binary response regression, hierarchical modeling, order-restricted inference, and robust modeling. Algorithms written in R are used to develop Bayesian tests and assess Bayesian models by use of the posterior predictive distribution. The use of R to interface with WinBUGS, a popular MCMC computing language, is described with several illustrative examples.This book is a suitable companion book for an introductory course on Bayesian methods and is valuable to the statistical practitioner who wishes to learn more about the R language and Bayesian methodology. The LearnBayes package, written by the author and available from the CRAN website, contains all of the R functions described in the book.The second edition contains several

new topics such as the use of mixtures of conjugate priors and the use of Zellner's g priors to choose between models in linear regression. There are more illustrations of the construction of informative prior distributions, such as the use of conditional means priors and multivariate normal priors in binary regressions. The new edition contains changes in the R code illustrations according to the latest edition of the LearnBayes package.

Bayesian Population Analysis Using WinBUGS - Marc Kery 2011-09-28
Bayesian statistics has exploded into biology and its sub-disciplines, such as ecology, over the past decade. The free software program WinBUGS, and its open-source sister OpenBugs, is currently the only flexible and general-purpose program available with which the average ecologist can conduct standard and non-standard Bayesian statistics. Comprehensive and richly commented examples illustrate a wide range of models that are most relevant to the research of a modern population ecologist All WinBUGS/OpenBUGS analyses are completely integrated in software R Includes complete documentation of all R and WinBUGS code required to conduct analyses and shows all the necessary steps from having the data in a text file out of Excel to interpreting and processing the output from WinBUGS in R

Bayesian Essentials with R - Jean-Michel Marin 2013-10-28
This Bayesian modeling book provides a self-contained entry to computational Bayesian statistics. Focusing on the most standard statistical models and backed up by real datasets and an all-inclusive R (CRAN) package called bayess, the book provides an operational methodology for conducting Bayesian inference, rather than focusing on its theoretical and philosophical justifications. Readers are empowered to participate in the real-life data analysis situations depicted here from the beginning. Special attention is paid to the

derivation of prior distributions in each case and specific reference solutions are given for each of the models. Similarly, computational details are worked out to lead the reader towards an effective programming of the methods given in the book. In particular, all R codes are discussed with enough detail to make them readily understandable and expandable. Bayesian Essentials with R can be used as a textbook at both undergraduate and graduate levels. It is particularly useful with students in professional degree programs and scientists to analyze data the Bayesian way. The text will also enhance introductory courses on Bayesian statistics. Prerequisites for the book are an undergraduate background in probability and statistics, if not in Bayesian statistics.

Bayesian Modeling Using WinBUGS - Ioannis Ntzoufras 2011-09-20
A hands-on introduction to the principles of Bayesian modeling using WinBUGS Bayesian Modeling Using WinBUGS provides an easily accessible introduction to the use of WinBUGS programming techniques in a variety of Bayesian modeling settings. The author provides an accessible treatment of the topic, offering readers a smooth introduction to the principles of Bayesian modeling with detailed guidance on the practical implementation of key principles. The book begins with a basic introduction to Bayesian inference and the WinBUGS software and goes on to cover key topics, including: Markov Chain Monte Carlo algorithms in Bayesian inference Generalized linear models Bayesian hierarchical models Predictive distribution and model checking Bayesian model and variable evaluation Computational notes and screen captures illustrate the use of both WinBUGS as well as R software to apply the discussed techniques. Exercises at the end of each chapter allow readers to test their understanding of the presented concepts and all data sets and code are available on the book's related Web site. Requiring only a working

knowledge of probability theory and statistics, Bayesian Modeling Using WinBUGS serves as an excellent book for courses on Bayesian statistics at the upper-undergraduate and graduate levels. It is also a valuable reference for researchers and practitioners in the fields of statistics, actuarial science, medicine, and the social sciences who use WinBUGS in their everyday work.

Bayesian Ideas and Data Analysis - Ronald Christensen 2011-07-07
Emphasizing the use of WinBUGS and R to analyze real data, Bayesian Ideas and Data Analysis: An Introduction for Scientists and Statisticians presents statistical tools to address scientific questions. It highlights foundational issues in statistics, the importance of making accurate predictions, and the need for scientists and statisticians to collaborate in analyzing data. The WinBUGS code provided offers a convenient platform to model and analyze a wide range of data. The first five chapters of the book contain core material that spans basic Bayesian ideas, calculations, and inference, including modeling one and two sample data from traditional sampling models. The text then covers Monte Carlo methods, such as Markov chain Monte Carlo (MCMC) simulation. After discussing linear structures in regression, it presents binomial regression, normal regression, analysis of variance, and Poisson regression, before extending these methods to handle correlated data. The authors also examine survival analysis and binary diagnostic testing. A complementary chapter on diagnostic testing for continuous outcomes is available on the book's website. The last chapter on nonparametric inference explores density estimation and flexible regression modeling of mean functions. The appropriate statistical analysis of data involves a collaborative effort between scientists and statisticians. Exemplifying this approach, Bayesian Ideas and Data Analysis focuses on the necessary tools and concepts for modeling and

analyzing scientific data. Data sets and codes are provided on a supplemental website.

Bayesian Analysis for the Social Sciences - Simon Jackman 2009-10-27
Bayesian methods are increasingly being used in the social sciences, as the problems encountered lend themselves so naturally to the subjective qualities of Bayesian methodology. This book provides an accessible introduction to Bayesian methods, tailored specifically for social science students. It contains lots of real examples from political science, psychology, sociology, and economics, exercises in all chapters, and detailed descriptions of all the key concepts, without assuming any background in statistics beyond a first course. It features examples of how to implement the methods using WinBUGS – the most-widely used Bayesian analysis software in the world – and R – an open-source statistical software. The book is supported by a Website featuring WinBUGS and R code, and data sets.

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.

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.

Doing Bayesian Data Analysis - John Kruschke 2010-11-25

There is an explosion of interest in Bayesian statistics, primarily because recently created computational methods have finally made Bayesian analysis tractable and accessible to a wide audience. Doing Bayesian Data Analysis, A Tutorial Introduction with R and BUGS, is for first year graduate students or advanced undergraduates and provides an accessible approach, as all mathematics is explained intuitively and with concrete examples. It assumes only algebra and 'rusty' calculus. Unlike other textbooks, this book begins with the basics, including essential concepts of probability and random sampling. The book gradually climbs all the way to advanced hierarchical modeling methods for realistic data. The text provides complete examples with the R programming language and BUGS software (both freeware), and begins with basic programming examples, working up gradually to complete programs for complex analyses and presentation graphics. These templates can be easily adapted for a large variety of students and their own research needs.The textbook bridges the students from their undergraduate training into modern Bayesian methods. Accessible, including the basics of essential concepts of probability and random sampling Examples with R programming language and BUGS software Comprehensive coverage of all scenarios addressed by non-bayesian textbooks- t-tests, analysis of variance (ANOVA) and comparisons in ANOVA, multiple regression, and chi-square (contingency table analysis). Coverage of experiment planning R and BUGS computer programming code on website Exercises have explicit purposes and guidelines for accomplishment

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.

Bayesian Analysis for Population Ecology - Ruth King 2009-10-30
Novel Statistical Tools for Conserving and Managing PopulationsBy gathering information on key demographic parameters, scientists can often predict how populations will develop in the future and relate these parameters to external influences, such as global warming. Because of their ability to easily incorporate random effects, fit state-space mode

Bayesian Ideas and Data Analysis - Ronald Christensen 2010-07-02
Emphasizing the use of WinBUGS and R to analyze real data, Bayesian Ideas and Data

Analysis: An Introduction for Scientists and Statisticians presents statistical tools to address scientific questions. It highlights foundational issues in statistics, the importance of making accurate predictions, and the need for scientists and statisticians to collaborate in analyzing data. The WinBUGS code provided offers a convenient platform to model and analyze a wide range of data. The first five chapters of the book contain core material that spans basic Bayesian ideas, calculations, and inference, including modeling one and two sample data from traditional sampling models. The text then covers Monte Carlo methods, such as Markov chain Monte Carlo (MCMC) simulation. After discussing linear structures in regression, it presents binomial regression, normal regression, analysis of variance, and Poisson regression, before extending these methods to handle correlated data. The authors also examine survival analysis and binary diagnostic testing. A complementary chapter on diagnostic testing for continuous outcomes is available on the book's website. The last chapter on nonparametric inference explores density estimation and flexible regression modeling of mean functions. The appropriate statistical analysis of data involves a collaborative effort between scientists and statisticians. Exemplifying this approach, Bayesian Ideas and Data Analysis focuses on the necessary tools and concepts for modeling and analyzing scientific data. Data sets and codes are provided on a supplemental website.

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.

Bayesian Approaches in Oncology Using R and OpenBUGS - Atanu Bhattacharjee
2020-12-14
Bayesian Approaches in Oncology Using R and OpenBUGS serves two audiences: those who are familiar with the theory and applications of bayesian approach and wish to learn or enhance their skills in R and OpenBUGS, and those who are enrolled in R and OpenBUGS-based course for bayesian approach implementation. For those who have never used R/OpenBUGS, the book begins with a self-contained introduction to R that lays the foundation for later chapters. Many books on the bayesian approach and the statistical analysis are advanced, and many are theoretical. While most of them do cover the objective, the fact remains that data analysis can not be performed without actually doing it, and this means using dedicated statistical software. There are several software packages, all with their specific objective. Finally, all packages are free to use, are versatile with problem-solving,

and are interactive with R and OpenBUGS. This book continues to cover a range of techniques related to oncology that grow in statistical analysis. It intended to make a single source of information on Bayesian statistical methodology for oncology research to cover several dimensions of statistical analysis. The book explains data analysis using real examples and includes all the R and OpenBUGS codes necessary to reproduce the analyses. The idea is to overall extending the Bayesian approach in oncology practice. It presents four sections to the statistical application framework: Bayesian in Clinical Research and Sample Size Calcuation Bayesian in Time-to-Event Data Analysis Bayesian in Longitudinal Data Analysis Bayesian in Diagnostics Test Statistics This book is intended as a first course in bayesian biostatistics for oncology students. An oncologist can find useful guidance for implementing bayesian in research work. It serves as a practical guide and an excellent resource for learning the theory and practice of bayesian methods for the applied statistician, biostatistician, and data scientist.

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.

Applied Bayesian Statistics - Mary Kathryn Cowles 2013-01-04
This book is based on over a dozen years teaching a Bayesian Statistics course. The material presented here has been used by students of different levels and disciplines, including advanced undergraduates studying Mathematics and Statistics and students in graduate programs in Statistics, Biostatistics, Engineering, Economics, Marketing, Pharmacy, and Psychology. The goal of the book is to impart the basics of designing and carrying out Bayesian analyses, and interpreting and communicating the results. In addition, readers will learn to use the predominant software for Bayesian model-fitting, R and OpenBUGS. The practical approach this book takes will help students of all levels to build understanding of the concepts and procedures required to answer real questions by performing Bayesian analysis of real data. Topics covered include comparing and contrasting Bayesian and classical methods, specifying hierarchical models, and assessing Markov chain Monte Carlo output. Kate Cowles taught Suzuki piano for many years before going to graduate school in Biostatistics. Her research

areas are Bayesian and computational statistics, with application to environmental science. She is on the faculty of Statistics at The University of Iowa.

Bayesian Statistical Modelling - P. Congdon 2001-05-02

Bayesian methods draw upon previous research findings and combine them with sample data to analyse problems and modify existing hypotheses. The calculations are often extremely complex, with many only now possible due to recent advances in computing technology. Bayesian methods have as a result gained wider acceptance, and are applied in many scientific disciplines, including applied statistics, public health research, medical science, the social sciences and economics. Bayesian Statistical Modelling presents an accessible overview of modelling applications from a Bayesian perspective. * Provides an integrated presentation of theory, examples and computer algorithms * Examines model fitting in practice using Bayesian principles * Features a comprehensive range of methodologies and modelling techniques * Covers recent innovations in bayesian modelling, including Markov Chain Monte Carlo methods * Includes extensive applications to health and social sciences * Features a comprehensive collection of nearly 200 worked examples * Data examples and computer code in WinBUGS are available via ftp Whilst providing a general overview of Bayesian modelling, the author places emphasis on the principles of prior selection, model identification and interpretation of findings, in a range of modelling innovations, focussing on their implementation with real data, with advice as to appropriate computing choices and strategies. Researchers in applied statistics, medical science, public health and the social sciences 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 good reference source for both researchers and students.

Applied Bayesian Hierarchical Methods - Peter D. Congdon 2010-05-19
The use of Markov chain Monte Carlo (MCMC) methods for estimating hierarchical models involves complex data structures and is often described as a revolutionary development. An intermediate-level treatment of Bayesian hierarchical models and their applications, Applied Bayesian Hierarchical Methods demonstrates the advantages of a Bayesian approach

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.

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.