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Applied Longitudinal Data Analysis-Judith D. Singer 2003-03-27 The investigation of change has fascinated researchers for generations, and to do it well, they must have longitudinal data. This text instructs readers in the methodologies at their disposal, including both individual growth modelling and survival analysis. Applied Longitudinal Data Analysis for Epidemiology-Jos W. R. Twisk 2013-05-09 This book discusses the most important techniques available for longitudinal data analysis, from simple techniques such as the paired t-test and summary statistics, to more sophisticated ones such as generalized estimating of equations and mixed model analysis. A distinction is made between longitudinal analysis with continuous, dichotomous and categorical outcome variables. The emphasis of the discussion lies in the interpretation and comparison of the results of the different techniques. The second edition includes new chapters on the role of the time variable and presents new features of longitudinal data analysis. Explanations have been clarified where necessary and several chapters have been completely rewritten. The analysis of data from experimental studies and the problem of missing data in longitudinal studies are discussed. Finally, an extensive overview and comparison of different software packages is provided. This practical guide is essential for non-statisticians and researchers working with longitudinal data from epidemiological and clinical studies.

Applied Longitudinal Analysis-Garrett M. Fitzmaurice 2012-10-23 Praise for the First Edition ". . . [this book] should be on the shelf of everyone interested in . . . longitudinal data analysis." —Journal of the American Statistical Association Features newly developed topics and applications of the analysis of longitudinal data Applied Longitudinal Analysis, Second Edition presents modern methods for analyzing data from longitudinal studies and now features the latest state-of-the-art techniques. The book emphasizes practical, rather than theoretical, aspects of methods for the analysis of diverse types of longitudinal data that can be applied across various fields of study, from the health and medical sciences to the social and behavioral sciences. The authors incorporate their extensive academic and research experience along with various updates that have been made in response to reader feedback. The Second Edition features six newly added chapters that explore topics currently evolving in the field, including: Fixed effects and mixed effects models Marginal models and generalized estimating equations Approximate methods for generalized linear mixed effects models Multiple imputation and inverse probability weighted methods Smoothing methods for longitudinal data Sample size and power Each chapter presents methods in the setting of applications to data sets drawn from the health sciences. New problem sets have been added to many chapters, and a related website features sample programs and computer output using SAS, Stata, and R, as well as data sets and supplemental slides to facilitate a complete understanding of the material. With its strong emphasis on multidisciplinary applications and the interpretation of results, Applied Longitudinal Analysis, Second Edition is an excellent book for courses on statistics in the health and medical sciences at the upper-undergraduate and graduate levels. The book also serves as a valuable reference for researchers and professionals in the medical, public health, and pharmaceutical fields as well as those in social and behavioral sciences who would like to learn more about analyzing longitudinal data.

Longitudinal Data Analysis-Jason Newsom 2013-06-19 This book provides accessible treatment to state-of-the-art approaches to analyzing longitudinal studies. Comprehensive coverage of the most popular analysis tools allows readers to pick and choose the techniques that best fit their research. The analyses are illustrated with examples from major longitudinal data sets including practical information about their content and design. Illustrations from popular software packages offer tips on how to interpret the results. Each chapter features suggested readings for additional study and a list of articles that further illustrate how to implement the analysis and report the results. Syntax examples for several software packages for each of the chapter examples are provided at www.psypress.com/longitudinal-data-analysis. Although many of the examples address health or social science questions related to aging, readers from other disciplines will find the analyses relevant to their work. In addition to demonstrating statistical analysis of longitudinal data, the book shows how to interpret and analyze the results within the context of the research design. The methods covered in this book are applicable to a range of applied problems including short- to long-term longitudinal studies using a range of sample sizes. The book provides non-technical, practical introductions to the concepts and issues relevant to longitudinal analysis. Topics include use of publicly available data sets, weighting and adjusting for complex sampling designs with longitudinal studies, missing data and attrition, measurement issues related to longitudinal research, the use of ANOVA and regression for average change over time, mediation analysis, growth curve models, basic and advanced structural equation models, and survival analysis. An ideal supplement for graduate level courses on data analysis and/or longitudinal modeling taught in psychology, gerontology, public health, human development, family studies, medicine, sociology, social work, and other behavioral, social, and health sciences, this multidisciplinary book will also appeal to researchers in these fields.

Longitudinal Data Analysis-Garrett Fitzmaurice 2008-08-11 Although many books currently available describe statistical models and methods for analyzing longitudinal data, they do not highlight connections between various research threads in the statistical literature. Responding to this void, Longitudinal Data Analysis provides a clear, comprehensive, and unified overview of state-of-the-art theory and applications. It also focuses on the assorted challenges that arise in analyzing longitudinal data. After discussing historical aspects, leading researchers explore four broad themes: parametric modeling, nonparametric and semiparametric methods, joint models, and incomplete data. Each of these sections begins with an introductory chapter that provides useful background material and a broad outline to set the stage for subsequent chapters. Rather than focus on a narrowly defined topic, chapters integrate important research discussions from the statistical literature. They seamlessly blend theory with applications and include examples and case studies from various disciplines. Destined to become a landmark publication in the field, this carefully edited collection emphasizes statistical models and methods likely to endure in the future. Whether involved in the development of statistical methodology or the analysis of longitudinal data, readers will gain new perspectives on the field.

Methods and Applications of Longitudinal Data Analysis-Xian Liu 2015-09-11 Methods and Applications of Longitudinal Data Analysis describes methods for the analysis of longitudinal data in the medical, biological and behavioral sciences. It introduces basic concepts and functions including a variety of regression models, and their practical applications across many areas of research. Statistical procedures featured within the text include: descriptive methods for delineating trends over time linear mixed regression models with both fixed and random effects covariance pattern models on correlated errors generalized estimating equations nonlinear regression models for categorical repeated measurements techniques for analyzing longitudinal data with non-ignorable missing observations Emphasis is given to applications of these methods, using substantial empirical illustrations, designed to help users of statistics better analyze and understand longitudinal data. Methods and Applications of Longitudinal Data Analysis equips both graduate students and professionals to confidently apply longitudinal data analysis to their particular discipline. It also provides a valuable reference source for applied statisticians, demographers and other quantitative methodologists. From novice to professional: this book starts with the introduction of basic models and ends with the description of some of the most advanced models in longitudinal data analysis Enables students to select the correct statistical methods to apply to their longitudinal data and avoid the pitfalls associated with incorrect selection Identifies the limitations of classical repeated measures models and describes newly developed techniques, along with real-world examples.

Modeling Longitudinal Data-Robert E. Weiss 2006-12-06 The book features many figures and tables illustrating longitudinal data and numerous homework problems. The associated web site contains many longitudinal data sets, examples of computer code, and labs to re-enforce the material. Weiss emphasizes continuous data rather than discrete data, graphical and covariance methods, and generalizations of

regression rather than generalizations of analysis of variance.

Longitudinal Data Analysis for the Behavioral Sciences Using R-Jeffrey D. Long 2011-10-31 This book is unique in its focus on showing students in the behavioral sciences how to analyze longitudinal data using R software. The book focuses on application, making it practical and accessible to students in psychology, education, and related fields, who have a basic foundation in statistics. It provides explicit instructions in R computer programming throughout the book, showing students exactly how a specific analysis is carried out and how output is interpreted.

Nonparametric Regression Methods for Longitudinal Data Analysis-Hulin Wu 2006-05-12 Incorporates mixed-effects modeling techniques for more powerful and efficient methods This book presents current and effective nonparametric regression techniques for longitudinal data analysis and systematically investigates the incorporation of mixed-effects modeling techniques into various nonparametric regression models. The authors emphasize modeling ideas and inference methodologies, although some theoretical results for the justification of the proposed methods are presented. With its logical structure and organization, beginning with basic principles, the text develops the foundation needed to master advanced principles and applications. Following a brief overview, data examples from biomedical research studies are presented and point to the need for nonparametric regression analysis approaches. Next, the authors review mixed-effects models and nonparametric regression models, which are the two key building blocks of the proposed modeling techniques. The core section of the book consists of four chapters dedicated to the major nonparametric regression methods: local polynomial, regression spline, smoothing spline, and penalized spline. The next two chapters extend these modeling techniques to semiparametric and time varying coefficient models for longitudinal data analysis. The final chapter examines discrete longitudinal data modeling and analysis. Each chapter concludes with a summary that highlights key points and also provides bibliographic notes that point to additional sources for further study. Examples of data analysis from biomedical research are used to illustrate the methodologies contained throughout the book.

Technical proofs are presented in separate appendices. With its focus on solving problems, this is an excellent textbook for upper-level undergraduate and graduate courses in longitudinal data analysis. It is also recommended as a reference for biostatisticians and other theoretical and applied research statisticians with an interest in longitudinal data analysis. Not only do readers gain an understanding of the principles of various nonparametric regression methods, but they also gain a practical understanding of how to use the methods to tackle real-world problems.

Longitudinal Analysis-Lesa Hoffman 2015-01-30 Longitudinal Analysis provides an accessible, application-oriented treatment of introductory and advanced linear models for within-person fluctuation and change. Organized by research design and data type, the text uses in-depth examples to provide a complete description of the model-building process. The core longitudinal models and their extensions are presented within a multilevel modeling framework, paying careful attention to the modeling concerns that are unique to longitudinal data. Written in a conversational style, the text provides verbal and visual interpretation of model equations to aid in their translation to empirical research results. Overviews and summaries, boldfaced key terms, and review questions will help readers synthesize the key concepts in each chapter. Written for non-mathematically-oriented readers, this text features: A description of the data manipulation steps required prior to model estimation so readers can more easily apply the steps to their own data An emphasis on how the terminology, interpretation, and estimation of familiar general linear models relates to those of more complex models for longitudinal data Integrated model comparisons, effect sizes, and statistical inference in each example to strengthen readers' understanding of the overall model-building process Sample results sections for each example to provide useful templates for published reports Examples using both real and simulated data in the text, along with syntax and output for SPSS, SAS, STATA, and Mplus at www.PilesOfVariance.com to help readers apply the models to their own data The book opens with the building blocks of longitudinal analysis—general ideas, the general linear model for between-person analysis, and between- and within-person models for the variance and the options within repeated measures analysis of variance. Section 2 introduces unconditional longitudinal models including alternative covariance structure models to describe within-person fluctuation over time and random effects models for within-person change. Conditional longitudinal models are presented in section 3, including both time-invariant and time-varying predictors. Section 4 reviews advanced applications, including alternative metrics of time in accelerated longitudinal designs, three-level models for multiple dimensions of within-person time, the analysis of individuals in groups over time, and repeated measures designs not involving time. The book concludes with additional considerations and future directions, including an overview of sample size planning and other model

extensions for non-normal outcomes and intensive longitudinal data. Class-tested at the University of Nebraska-Lincoln and in intensive summer workshops, this is an ideal text for graduate-level courses on longitudinal analysis or general multilevel modeling taught in psychology, human development and family studies, education, business, and other behavioral, social, and health sciences. The book's accessible approach will also help those trying to learn on their own. Only familiarity with general linear models (regression, analysis of variance) is needed for this text.

Applied Longitudinal Data Analysis-Marie Davidian 2010-08-01 The goal of this book is to provide an overview of statistical models and methods that are useful in the analysis of longitudinal data; that is, data in the form of repeated measurements on the same experimental unit over time. The intended audience is a combination of non- statistics graduate students who have taken an applied methods course covering linear regression and Analysis of Variance and masters-level statistics students looking for an applied intro course.

Longitudinal Data Analysis-Professor Catrien C J H C J H Bijleveld 1998-10-26 By looking at the processes of change over time - by carrying out longitudinal studies - researchers answer questions about learning, development, educational growth, social change and medical outcomes. However, longitudinal research has many faces. This book examines all the main approaches as well as newer developments (such as structural equation modelling, multilevel modelling and optimal scaling) to enable the reader to gain a thorough understanding of the approach and make appropriate decisions about which technique can be applied to the research problem. Conceptual explanations are used to keep technical terms to a minimum; examples are provided for each approach; issues of design, measurement and significance are considered; and a standard notation is used throughout.

Linear Mixed Models for Longitudinal Data-Geert Verbeke 2009-05-12 This book provides a comprehensive treatment of linear mixed models for continuous longitudinal data. Next to model formulation, this edition puts major emphasis on exploratory data analysis for all aspects of the model, such as the marginal model, subject-specific profiles, and residual covariance structure. Further, model diagnostics and missing data receive extensive treatment. Sensitivity analysis for incomplete data is given a prominent place. Most analyses were done with the MIXED procedure of the SAS software package, but the data analyses are presented in a software-independent fashion.

Longitudinal Data and SAS-Ron Cody, EdD 2001-10-15 Working with longitudinal data introduces a unique set of challenges. Once you've mastered the art of performing calculations within a single observation of a data set, you're faced with the task of performing calculations or making comparisons between observations. It's easy to look backward in data sets, but how do you look forward and across observations? Ron Cody provides straightforward answers to these and other questions. Longitudinal Data and SAS details useful techniques for conducting operations between observations in a SAS data set. For quick reference, the book is conveniently organized to cover tools, including an introduction to powerful SAS programming techniques for longitudinal data; case studies, including a variety of illuminating examples that use Ron's techniques; and macros, including detailed descriptions of helpful longitudinal data macros. Beginning to intermediate SAS users will appreciate this book's informative, easy-to-comprehend style. And users who frequently process longitudinal data will learn to make the most of their analyses by following Ron's methodologies. This book is part of the SAS Press program.

Joint Models for Longitudinal and Time-to-Event Data-Dimitris Rizopoulos 2012-06-22 In longitudinal studies it is often of interest to investigate how a marker that is repeatedly measured in time is associated with a time to an event of interest, e.g., prostate cancer studies where longitudinal PSA level measurements are collected in conjunction with the time-to-recurrence. Joint Models for Longitudinal and Time-to-Event Data: With Applications in R provides a full treatment of random effects joint models for longitudinal and time-to-event outcomes that can be utilized to analyze such data. The content is primarily explanatory, focusing on applications of joint modeling, but sufficient mathematical details are provided to facilitate understanding of the key features of these models. All illustrations put forward can be implemented in the R programming language via the freely available package JM written by the author. All the R code used in the book is available at: <http://jmr.r-forge.r-project.org/>

Longitudinal Data Analysis-Donald Hedeker 2006-05-12 Longitudinal data analysis for biomedical and behavioral sciences This innovative book sets forth and describes methods for the analysis of longitudinal data, emphasizing applications to problems in the biomedical and behavioral sciences.

Reflecting the growing importance and use of longitudinal data across many areas of research, the text is designed to help users of statistics better analyze and understand this type of data. Much of the material from the book grew out of a course taught by Dr. Hedeker on longitudinal data analysis. The material is,

therefore, thoroughly classroom tested and includes a number of features designed to help readers better understand and apply the material. Statistical procedures featured within the text include: * Repeated measures analysis of variance * Multivariate analysis of variance for repeated measures * Random-effects regression models (RRM) * Covariance-pattern models * Generalized-estimating equations (GEE) models * Generalizations of RRM and GEE for categorical outcomes Practical in their approach, the authors emphasize the applications of the methods, using real-world examples for illustration. Some syntax examples are provided, although the authors do not generally focus on software in this book. Several datasets and computer syntax examples are posted on this title's companion Web site. The authors intend to keep the syntax examples current as new versions of the software programs emerge. This text is designed for both undergraduate and graduate courses in longitudinal data analysis. Instructors can take advantage of overheads and additional course materials available online for adopters. Applied statisticians in biomedicine and the social sciences can also use the book as a convenient reference.

Multilevel and Longitudinal Modeling with IBM SPSS-Ronald H. Heck 2013-08-22 This book demonstrates how to use multilevel and longitudinal modeling techniques available in the IBM SPSS mixed-effects program (MIXED). Annotated screen shots provide readers with a step-by-step understanding of each technique and navigating the program. Readers learn how to set up, run, and interpret a variety of models. Diagnostic tools, data management issues, and related graphics are introduced throughout. Annotated syntax is also available for those who prefer this approach. Extended examples illustrate the logic of model development to show readers the rationale of the research questions and the steps around which the analyses are structured. The data used in the text and syntax examples are available at www.routledge.com/9780415817110. Highlights of the new edition include: Updated throughout to reflect IBM SPSS Version 21. Further coverage of growth trajectories, coding time-related variables, covariance structures, individual change and longitudinal experimental designs (Ch.5). Extended discussion of other types of research designs for examining change (e.g., regression discontinuity, quasi-experimental) over time (Ch.6). New examples specifying multiple latent constructs and parallel growth processes (Ch. 7). Discussion of alternatives for dealing with missing data and the use of sample weights within multilevel data structures (Ch.1). The book opens with the conceptual and methodological issues associated with multilevel and longitudinal modeling, followed by a discussion of SPSS data management techniques which facilitate working with multilevel, longitudinal, and cross-classified data sets. Chapters 3 and 4 introduce the basics of multilevel modeling: developing a multilevel model, interpreting output, and trouble-shooting common programming and modeling problems. Models for investigating individual and organizational change are presented in chapters 5 and 6, followed by models with multivariate outcomes in chapter 7. Chapter 8 provides an illustration of multilevel models with cross-classified data structures. The book concludes with ways to expand on the various multilevel and longitudinal modeling techniques and issues when conducting multilevel analyses. Ideal as a supplementary text for graduate courses on multilevel and longitudinal modeling, multivariate statistics, and research design taught in education, psychology, business, and sociology, this book's practical approach also appeals to researchers in these fields. The book provides an excellent supplement to Heck & Thomas's *An Introduction to Multilevel Modeling Techniques*, 2nd Edition; however, it can also be used with any multilevel and/or longitudinal modeling book or as a stand-alone text.

Longitudinal Structural Equation Modeling-Jason T. Newsom 2015-06-19 This comprehensive resource reviews structural equation modeling (SEM) strategies for longitudinal data to help readers see which modeling options are available for which hypotheses. The author demonstrates how SEM is related to other longitudinal data techniques throughout. By exploring connections between models, readers gain a better understanding of when to choose one analysis over another. The book explores basic models to sophisticated ones including the statistical and conceptual underpinnings that are the building blocks of the analyses. Accessibly written, research examples from the behavioral and social sciences and results interpretations are provided throughout. The emphasis is on concepts and practical guidance for applied research rather than on mathematical proofs. New terms are highlighted and defined in the glossary. Figures are included for every model along with detailed discussions of model specification and implementation issues. Each chapter also includes examples of each model type, comment sections that provide practical guidance, model extensions, and recommended readings. Highlights include: Covers the major SEM approaches to longitudinal analysis in one resource. Explores connections between longitudinal SEM models to enhance integration. Numerous examples that help readers match research questions to appropriate analyses and interpret results. Reviews practical issues related to model specification and estimation to reinforce connections. Analyzes continuous and discrete (binary and

ordinal) variables throughout for breadth not found in other sources. Reviews key SEM concepts for those who need a refresher (Ch. 1). Emphasizes how to apply and interpret each model through realistic data examples. Provides the book's data sets at www.longitudinalsem.com along with the Mplus and R-lavaan syntax used to generate the results. Introduces the LISREL notation system used throughout (Appendix A). The chapters can be read out of order but it is best to read chapters 1 - 4 first because most of the later chapters refer back to them. The book opens with a review of latent variables and analysis of binary and ordinal variables. Chapter 2 applies this information to assessing longitudinal measurement invariance. SEM tests of dependent means and proportions over time points are explored in Chapter 3, and stability and change, difference scores, and lagged regression are covered in Chapter 4. The remaining chapters are each devoted to one major type of longitudinal SEM -- repeated measures analysis models, full cross-lagged panel models and simplex models, modeling stability with state-trait models, linear and nonlinear growth curve models, latent difference score models, latent transition analysis, time series analysis, survival analysis, and attrition. Missing data is discussed in the context of many of the preceding models in Chapter 13. Ideal for graduate courses on longitudinal (data) analysis, advanced SEM, longitudinal SEM, and/or advanced data (quantitative) analysis taught in the behavioral, social, and health sciences, this text also appeals to researchers in these fields. Intended for those without an extensive math background, prerequisites include familiarity with basic SEM. Matrix algebra is avoided in all but a few places.

Joint Modeling of Longitudinal and Time-to-Event Data-Robert Elashoff 2016-10-04 Longitudinal studies often incur several problems that challenge standard statistical methods for data analysis. These problems include non-ignorable missing data in longitudinal measurements of one or more response variables, informative observation times of longitudinal data, and survival analysis with intermittently measured time-dependent covariates that are subject to measurement error and/or substantial biological variation. Joint modeling of longitudinal and time-to-event data has emerged as a novel approach to handle these issues. Joint Modeling of Longitudinal and Time-to-Event Data provides a systematic introduction and review of state-of-the-art statistical methodology in this active research field. The methods are illustrated by real data examples from a wide range of clinical research topics. A collection of data sets and software for practical implementation of the joint modeling methodologies are available through the book website. This book serves as a reference book for scientific investigators who need to analyze longitudinal and/or survival data, as well as researchers developing methodology in this field. It may also be used as a textbook for a graduate level course in biostatistics or statistics.

Longitudinal Structural Equation Modeling-Todd D. Little 2013-02-26 Featuring actual datasets as illustrative examples, this book reveals numerous ways to apply structural equation modeling (SEM) to any repeated-measures study. Initial chapters lay the groundwork for modeling a longitudinal change process, from measurement, design, and specification issues to model evaluation and interpretation. Covering both big-picture ideas and technical "how-to-do-it" details, the author deftly walks through when and how to use longitudinal confirmatory factor analysis, longitudinal panel models (including the multiple-group case), multilevel models, growth curve models, and complex factor models, as well as models for mediation and moderation. User-friendly features include equation boxes that clearly explain the elements in every equation, end-of-chapter glossaries, and annotated suggestions for further reading. The companion website (www.guilford.com/little-materials) provides datasets for all of the examples--which include studies of bullying, adolescent students' emotions, and healthy aging--with syntax and output from LISREL, Mplus, and R (lavaan).

Models for Discrete Longitudinal Data-Geert Molenberghs 2006-08-30 The linear mixed model has become the main parametric tool for the analysis of continuous longitudinal data, as the authors discussed in their 2000 book. Without putting too much emphasis on software, the book shows how the different approaches can be implemented within the SAS software package. The authors received the American Statistical Association's Excellence in Continuing Education Award based on short courses on longitudinal and incomplete data at the Joint Statistical Meetings of 2002 and 2004.

Practical Longitudinal Data Analysis-David J. Hand 2017-10-06 This text describes regression-based approaches to analyzing longitudinal and repeated measures data. It emphasizes statistical models, discusses the relationships between different approaches, and uses real data to illustrate practical applications. It uses commercially available software when it exists and illustrates the program code and output. The data appendix provides many real data sets-beyond those used for the examples-which can serve as the basis for exercises.

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.

Intensive Longitudinal Methods-Niall Bolger 2013-01-22 This book offers a complete, practical guide to doing an intensive longitudinal study with individuals, dyads, or groups. It provides the tools for studying social, psychological, and physiological processes in everyday contexts, using methods such as diary and experience sampling. A range of engaging, worked-through research examples with datasets are featured. Coverage includes how to: select the best intensive longitudinal design for a particular research question, apply multilevel models to within-subject designs, model within-subject change processes for continuous and categorical outcomes, assess the reliability of within-subject changes, assure sufficient statistical power, and more. Several end-of-chapter write-ups illustrate effective ways to present study findings for publication. Datasets and output in SPSS, SAS, Mplus, HLM, MLwiN, and R for the examples are available on the companion website (www.intensivelongitudinal.com).

Models for Intensive Longitudinal Data-Theodore A. Walls 2006-01-19 Rapid technological advances in devices used for data collection have led to the emergence of a new class of longitudinal data: intensive longitudinal data (ILD). Behavioral scientific studies now frequently utilize handheld computers, beepers, web interfaces, and other technological tools for collecting many more data points over time than previously possible. Other protocols, such as those used in fMRI and monitoring of public safety, also produce ILD, hence the statistical models in this volume are applicable to a range of data. The volume features state-of-the-art statistical modeling strategies developed by leading statisticians and methodologists working on ILD in conjunction with behavioral scientists. Chapters present applications from across the behavioral and health sciences, including coverage of substantive topics such as stress, smoking cessation, alcohol use, traffic patterns, educational performance and intimacy. *Models for Intensive Longitudinal Data (MILD)* is designed for those who want to learn about advanced statistical models for intensive longitudinal data and for those with an interest in selecting and applying a given model. The chapters highlight issues of general concern in modeling these kinds of data, such as a focus on regulatory systems, issues of curve registration, variable frequency and spacing of measurements, complex multivariate patterns of change, and multiple independent series. The extraordinary breadth of coverage makes this an indispensable reference for principal investigators designing new studies that will introduce ILD, applied statisticians working on related models, and methodologists, graduate students, and applied analysts working in a range of fields. A companion Web site at www.oup.com/us/MILD contains program examples and documentation.

Quantitative Longitudinal Data Analysis-Vernon Gayle 2020-12-10 First published Open Access under a Creative Commons license as *What is Quantitative Longitudinal Data Analysis?*, this title is now also available as part of the Bloomsbury Research Methods series. Across the social sciences, there is widespread agreement that quantitative longitudinal research designs offer analysts powerful scientific data resources. But, to date, many texts on analysing longitudinal social analysis surveys have been written from a statistical, rather than a social science data analysis perspective and they lack adequate coverage of common practical challenges associated with social science data analyses. This book provides a practical and up-to-date introduction to influential approaches to quantitative longitudinal data analysis in the social sciences. The book introduces definitions and terms, explains the relative attractions of such a longitudinal design, and offers an introduction to the main techniques of analysis, explaining their requirements, statistical properties and their substantive contribution.

Ante-dependence Models for Longitudinal Data-Dale L. Zimmerman 2009-08-19 The First Book Dedicated to This Class of Longitudinal Models Although ante-dependence models are particularly useful for

modeling longitudinal data that exhibit serial correlation, few books adequately cover these models. By gathering results scattered throughout the literature, *Antedependence Models for Longitudinal Data* offers a convenient, systematic way to learn about antedependence models. Illustrated with numerous examples, the book also covers some important statistical inference procedures associated with these models. After describing unstructured and structured antedependence models and their properties, the authors discuss informal model identification via simple summary statistics and graphical methods. They then present formal likelihood-based procedures for normal antedependence models, including maximum likelihood and residual maximum likelihood estimation of parameters as well as likelihood ratio tests and penalized likelihood model selection criteria for the model's covariance structure and mean structure. The authors also compare the performance of antedependence models to other models commonly used for longitudinal data. With this book, readers no longer have to search across widely scattered journal articles on the subject. The book provides a thorough treatment of the properties and statistical inference procedures of various antedependence models.

Longitudinal Data with Serial Correlation-Richard .H. Jones 2018-05-04 First Published in 2018. Routledge is an imprint of Taylor & Francis, an Informa company.

Analysis of Longitudinal Data-Peter Diggle 2013-03-14 This second edition has been completely revised and expanded to become the most up-to-date and thorough professional reference text in this fast-moving area of biostatistics. It contains an additional two chapters on fully parametric models for discrete repeated measures data and statistical models for time-dependent predictors.

Nonparametric Models for Longitudinal Data-Colin O. Wu 2018-05-23 *Nonparametric Models for Longitudinal Data with Implementations in R* presents a comprehensive summary of major advances in nonparametric models and smoothing methods with longitudinal data. It covers methods, theories, and applications that are particularly useful for biomedical studies in the era of big data and precision medicine. It also provides flexible tools to describe the temporal trends, covariate effects and correlation structures of repeated measurements in longitudinal data. This book is intended for graduate students in statistics, data scientists and statisticians in biomedical sciences and public health. As experts in this area, the authors present extensive materials that are balanced between theoretical and practical topics. The statistical applications in real-life examples lead into meaningful interpretations and inferences. Features: Provides an overview of parametric and semiparametric methods Shows smoothing methods for unstructured nonparametric models Covers structured nonparametric models with time-varying coefficients Discusses nonparametric shared-parameter and mixed-effects models Presents nonparametric models for conditional distributions and functionals Illustrates implementations using R software packages Includes datasets and code in the authors' website Contains asymptotic results and theoretical derivations

Latent Markov Models for Longitudinal Data-Francesco Bartolucci 2012-10-29 Drawing on the authors' extensive research in the analysis of categorical longitudinal data, *Latent Markov Models for Longitudinal Data* focuses on the formulation of latent Markov models and the practical use of these models. Numerous examples illustrate how latent Markov models are used in economics, education, sociology, and other fields. The R and MATLAB® routines used for the examples are available on the authors' website. The book provides you with the essential background on latent variable models, particularly the latent class model. It discusses how the Markov chain model and the latent class model represent a useful paradigm for latent Markov models. The authors illustrate the assumptions of the basic version of the latent Markov model and introduce maximum likelihood estimation through the Expectation-Maximization algorithm. They also cover constrained versions of the basic latent Markov model, describe the inclusion of the individual covariates, and address the random effects and multilevel extensions of the model. After covering advanced topics, the book concludes with a discussion on Bayesian inference as an alternative to maximum likelihood inference. As longitudinal data become increasingly relevant in many fields, researchers must rely on specific statistical and econometric models tailored to their application. A complete overview of latent Markov models, this book demonstrates how to use the models in three types of analysis: transition analysis with measurement errors, analyses that consider unobserved heterogeneity, and finding clusters of units and studying the transition between the clusters.

Dynamic Mixed Models for Familial Longitudinal Data-Brajendra C. Sutradhar 2011-01-27 This book provides a theoretical foundation for the analysis of discrete data such as count and binary data in the longitudinal setup. Unlike the existing books, this book uses a class of auto-correlation structures to model the longitudinal correlations for the repeated discrete data that accommodates all possible Gaussian type auto-correlation models as special cases including the equi-correlation models. This new dynamic modelling approach is utilized to develop theoretically sound inference techniques such as the generalized

quasi-likelihood (GQL) technique for consistent and efficient estimation of the underlying regression effects involved in the model, whereas the existing 'working' correlations based GEE (generalized estimating equations) approach has serious theoretical limitations both for consistent and efficient estimation, and the existing random effects based correlations approach is not suitable to model the longitudinal correlations. The book has exploited the random effects carefully only to model the correlations of the familial data. Subsequently, this book has modelled the correlations of the longitudinal data collected from the members of a large number of independent families by using the class of auto-correlation structures conditional on the random effects. The book also provides models and inferences for discrete longitudinal data in the adaptive clinical trial set up. The book is mathematically rigorous and provides details for the development of estimation approaches under selected familial and longitudinal models. Further, while the book provides special cares for mathematics behind the correlation models, it also presents the illustrations of the statistical analysis of various real life data. This book will be of interest to the researchers including graduate students in biostatistics and econometrics, among other applied statistics research areas. Brajendra Sutradhar is a University Research Professor at Memorial University in St. John's, Canada. He is an elected member of the International Statistical Institute and a fellow of the American Statistical Association. He has published about 110 papers in statistics journals in the area of multivariate analysis, time series analysis including forecasting, sampling, survival analysis for correlated failure times, robust inferences in generalized linear mixed models with outliers, and generalized linear longitudinal mixed models with bio-statistical and econometric applications. He has served as an associate editor for six years for Canadian Journal of Statistics and for four years for the Journal of Environmental and Ecological Statistics. He has served for 3 years as a member of the advisory committee on statistical methods in Statistics Canada. Professor Sutradhar was awarded 2007 distinguished service award of Statistics Society of Canada for his many years of services to the society including his special services for society's annual meetings.

Hierarchical Linear Modeling-G. David Garson 2012-04-10 This book provides a brief, easy-to-read guide to implementing hierarchical linear modelling using the three leading software platforms, followed by a set of application articles based on recent work published in leading journals and as part of doctoral dissertations. The "guide" portion consists of three chapters by the editor, covering basic to intermediate use of SPSS, SAS, and HLM for purposes for hierarchical linear modelling, while the "applications" portion consists of a dozen contributions in which the authors emphasize how-to and methodological aspects and show how they have used these techniques in practice.

Analyzing Longitudinal Clinical Trial Data-Craig Mallinckrodt 2016-12-12 Analyzing Longitudinal Clinical Trial Data: A Practical Guide provide practical and easy to implement approaches for bringing the latest theory on analysis of longitudinal clinical trial data into routine practice. This book, with its example-oriented approach that includes numerous SAS and R code fragments, is an essential resource for statisticians and graduate students specializing in medical research. The authors provide clear descriptions of the relevant statistical theory and illustrate practical considerations for modeling longitudinal data. Topics covered include choice of endpoint and statistical test; modeling means and the correlations between repeated measurements; accounting for covariates; modeling categorical data; model verification; methods for incomplete (missing) data that includes the latest developments in sensitivity analyses, along with approaches for and issues in choosing estimands; and means for preventing missing data. Each chapter stands alone in its coverage of a topic. The concluding chapters provide detailed advice on how to integrate these independent topics into an over-arching study development process and statistical analysis plan.

Best Practices in Quantitative Methods-Jason W. Osborne 2008 The contributors to Best Practices in Quantitative Methods envision quantitative methods in the 21st century, identify the best practices, and, where possible, demonstrate the superiority of their recommendations empirically. Editor Jason W. Osborne designed this book with the goal of providing readers with the most effective, evidence-based, modern quantitative methods and quantitative data analysis across the social and behavioral sciences. The text is divided into five main sections covering select best practices in Measurement, Research Design, Basics of Data Analysis, Quantitative Methods, and Advanced Quantitative Methods. Each chapter contains a current and expansive review of the literature, a case for best practices in terms of method, outcomes, inferences, etc., and broad-ranging examples along with any empirical evidence to show why certain techniques are better. Key Features: Describes important implicit knowledge to readers: The chapters in this volume explain the important details of seemingly mundane aspects of quantitative research, making them accessible to readers and demonstrating why it is important to pay attention to

these details. Compares and contrasts analytic techniques: The book examines instances where there are multiple options for doing things, and make recommendations as to what is the "best" choice—or choices, as what is best often depends on the circumstances. Offers new procedures to update and explicate traditional techniques: The featured scholars present and explain new options for data analysis, discussing the advantages and disadvantages of the new procedures in depth, describing how to perform them, and demonstrating their use. Intended Audience: Representing the vanguard of research methods for the 21st century, this book is an invaluable resource for graduate students and researchers who want a comprehensive, authoritative resource for practical and sound advice from leading experts in quantitative methods.

Longitudinal Data Analysis-Toon Taris 2000-11-13 This accessible introduction to the theory and practice of longitudinal research takes the reader through the strengths and weaknesses of this kind of research, making clear: how to design a longitudinal study; how to collect data most effectively; how to make the best use of statistical techniques; and how to interpret results. Although the book provides a broad overview of the field, the focus is always on the practical issues arising out of longitudinal research. This book supplies the student with all that they need to get started and acts as a manual for dealing with opportunities and pitfalls. It is the ideal primer for this growing area of social research.

Nonparametric Regression Analysis of Longitudinal Data-Hans-Georg Müller 2012-12-06 This monograph reviews some of the work that has been done for longitudinal data in the rapidly expanding field of nonparametric regression. The aim is to give the reader an impression of the basic mathematical tools that have been applied, and also to provide intuition about the methods and applications. Applications to the analysis of longitudinal studies are emphasized to encourage the non-specialist and applied statistician to try these methods out. To facilitate this, FORTRAN programs are provided which carry out some of the procedures described in the text. The emphasis of most research work so far has been on the theoretical aspects of nonparametric regression. It is my hope that these techniques will gain a firm place in the repertoire of applied statisticians who realize the large potential for convincing applications and the need to use these techniques concurrently with parametric regression. This text evolved during a set of lectures given by the author at the Division of Statistics at the University of California, Davis in Fall 1986 and is based on the author's Habilitationsschrift submitted to the University of Marburg in Spring 1985 as well as on published and unpublished work. Completeness is not attempted, neither in the text nor in the references. The following persons have been particularly generous in sharing research or giving advice: Th. Gasser, P. Ihm, Y. P. Mack, V. Mammi tzsch, G . G. Roussas, U. Stadtmuller, W. Stute and R.

The SAGE Handbook of Quantitative Methods in Psychology-Roger E Millsap 2009-08-05 `I often... wonder to myself whether the field needs another book, handbook, or encyclopedia on this topic. In this case I think that the answer is truly yes. The handbook is well focused on important issues in the field, and the chapters are written by recognized authorities in their fields. The book should appeal to anyone who wants an understanding of important topics that frequently go uncovered in graduate education in psychology' - David C Howell, Professor Emeritus, University of Vermont Quantitative psychology is arguably one of the oldest disciplines within the field of psychology and nearly all psychologists are exposed to quantitative psychology in some form. While textbooks in statistics, research methods and psychological measurement exist, none offer a unified treatment of quantitative psychology. The SAGE Handbook of Quantitative Methods in Psychology does just that. Each chapter covers a methodological topic with equal attention paid to established theory and the challenges facing methodologists as they address new research questions using that particular methodology. The reader will come away from each chapter with a greater understanding of the methodology being addressed as well as an understanding of the directions for future developments within that methodological area. Drawing on a global scholarship, the Handbook is divided into seven parts: Part One: Design and Inference: addresses issues in the inference of causal relations from experimental and non-experimental research, along with the design of true experiments and quasi-experiments, and the problem of missing data due to various influences such as attrition or non-compliance. Part Two: Measurement Theory: begins with a chapter on classical test theory, followed by the common factor analysis model as a model for psychological measurement. The models for continuous latent variables in item-response theory are covered next, followed by a chapter on discrete latent variable models as represented in latent class analysis. Part Three: Scaling Methods: covers metric and non-metric scaling methods as developed in multidimensional scaling, followed by consideration of the scaling of discrete measures as found in dual scaling and correspondence analysis. Models for preference data such as those found in random utility theory are covered next. Part Four: Data Analysis: includes chapters on regression models, categorical data analysis, multilevel or hierarchical

models, resampling methods, robust data analysis, meta-analysis, Bayesian data analysis, and cluster analysis. Part Five: Structural Equation Models: addresses topics in general structural equation modeling, nonlinear structural equation models, mixture models, and multilevel structural equation models. Part Six: Longitudinal Models: covers the analysis of longitudinal data via mixed modeling, time series analysis and event history analysis. Part Seven: Specialized Models: covers specific topics including the analysis of neuro-imaging data and functional data-analysis.

Linear Mixed Models for Longitudinal Data-Geert Verbeke 2009-05-12 This book provides a comprehensive treatment of linear mixed models for continuous longitudinal data. Next to model formulation, this edition puts major emphasis on exploratory data analysis for all aspects of the model, such as the marginal model, subject-specific profiles, and residual covariance structure. Further, model diagnostics and missing data receive extensive treatment. Sensitivity analysis for incomplete data is given a prominent place. Most analyses were done with the MIXED procedure of the SAS software package, but the data analyses are presented in a software-independent fashion.

Correlated Data Analysis: Modeling, Analytics, and Applications-Peter X. -K. Song 2007-06-30 This book covers recent developments in correlated data analysis. It utilizes the class of dispersion models as marginal components in the formulation of joint models for correlated data. This enables the book to cover a broader range of data types than the traditional generalized linear models. The reader is provided with a systematic treatment for the topic of estimating functions, and both generalized estimating equations (GEE) and quadratic inference functions (QIF) are studied as special cases. In addition to the discussions on marginal models and mixed-effects models, this book covers new topics on joint regression analysis based on Gaussian copulas.

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