Models For Discrete Longitudinal Data Springer Series In Statistics

Longitudinal Structural Equation ModelingLongitudinal Data AnalysisDynamic Mixed Models for Familial Longitudinal DataCorrelated Data Analysis: Modeling, Analytics, and ApplicationsModeling Longitudinal DataMixed Effects Models for Complex DataGeneralized Linear and Nonlinear Models for Correlated DataMathematical Asset ManagementLongitudinal Research with Latent VariablesHierarchical Modelling of Discrete Longitudinal DataQuantitative Longitudinal Data AnalysisHandbook of Cognitive AgingLinear and Generalized Linear Mixed Models and Their ApplicationsNonparametric Regression Methods for Longitudinal Data AnalysisHierarchical Linear ModelingDynamic Mixed Models for Familial Longitudinal DataApplied Logistic RegressionLinear Mixed Models for Longitudinal DataApplied Longitudinal Data AnalysisNonlinear Models for Repeated Measurement DataModeling Nonignorable Missing Data for Clustered Longitudinal Discrete OutcomesApplied Longitudinal Data AnalysisMultivariate Generalized Linear Mixed Models Using RJoint Modeling of Longitudinal and Time-to-Event DataMethods and Applications of Longitudinal Data AnalysisJournal of the American Statistical AssociationMultivariate Statistical Modelling Based on Generalized Linear ModelsMissing Data in Longitudinal StudiesHeavy-tailed Longitudinal Data Modeling Using CopulasJoint Modeling of Longitudinal Data and Discrete-time Survival Outcome with Application to Studying Tuberculosis Immunology DataGeneralized Latent Variable ModelingModels for Discrete Longitudinal DataBeyesian Semiparametric Models for Discrete Longitudinal DataApplied Longitudinal AnalysisNonparametric Regression Methods for Longitudinal Data AnalysisLongitudinal Data AnalysisGeneralized Linear ModelsAntedependence Models for Longitudinal DataLatent Markov Models for Longitudinal DataAnalysis of Longitudinal Data

Longitudinal Structural Equation Modeling

This book covers recent developments in correlated data analysis, using the class of dispersion models as marginal components in the formulation of joint models for correlated data. Much new material is covered here that you won't find elsewhere.

Longitudinal Data Analysis

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.

Dynamic Mixed Models for Familial Longitudinal Data

Although standard mixed effects models are useful in a range of studies, other approaches must often be used in correlation with them when studying complex or incomplete data. Mixed Effects Models for Complex Data discusses commonly used mixed effects models and presents appropriate approaches to address dropouts, missing data, measurement errors, censoring, and outliers. For each class of mixed effects model, the author reviews the corresponding class of regression model for cross-sectional data. An overview of general models and methods, along with motivating examples After presenting real data examples and outlining general approaches to the analysis of longitudinal/clustered data and incomplete data, the book introduces linear mixed effects (LME) models, generalized linear mixed models (GLMMs), nonlinear mixed effects (NLME) models, and semiparametric and nonparametric mixed effects models. It also includes general approaches for the analysis of complex data with missing values, measurement errors, censoring, and outliers. Self-contained coverage of specific topics Subsequent chapters delve more deeply into missing data problems, covariate measurement errors, and censored responses in mixed effects models. Focusing on incomplete data, the book also covers survival and frailty models, joint models of survival and longitudinal data, robust methods for mixed effects models, marginal generalized estimating equation (GEE) models for longitudinal or clustered data, and Bayesian methods for mixed effects models. Background material In the appendix, the author provides background information, such as likelihood theory, the Gibbs sampler, rejection and importance sampling methods, numerical integration methods, optimization methods, bootstrap, and matrix algebra. Failure to properly address missing data, measurement errors, and other issues in statistical analyses can lead to severely biased or misleading results. This book explores the biases that arise when naïve methods are used and shows which approaches should be used to achieve accurate results in longitudinal data analysis.

Correlated Data Analysis: Modeling, Analytics, and Applications

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.

Modeling Longitudinal Data

A new edition of the definitive guide to logistic regression modeling for health science and other applications This thoroughly expanded Third Edition provides an easily accessible introduction to the logistic regression (LR) model and highlights the power of this model by examining the relationship between a dichotomous outcome and a set of covariables. Applied Logistic Regression, Third Edition emphasizes applications in the health sciences and handpicks topics that best suit the use of modern statistical software. The book provides readers with state-of-the-art techniques for building, interpreting, and assessing the performance of LR models. New and updated features include: A chapter on the analysis of correlated outcome data A wealth of additional material for topics ranging from Bayesian methods to assessing model fit Rich data sets from real-world studies that demonstrate each method under discussion Detailed examples and interpretation of the presented results as well as exercises throughout Applied Logistic Regression, Third Edition is a must-have guide for professionals and researchers who need to model nominal or ordinal scaled outcome variables in public health, medicine, and the social sciences as well as a wide range of other fields and disciplines.

Mixed Effects Models for Complex Data

Edward Vonesh's Generalized Linear and Nonlinear Models for Correlated Data: Theory and Applications Using SAS is devoted to the analysis of correlated response data using SAS, with special emphasis on applications that require the use of generalized linear models or generalized nonlinear models. Written in a clear, easy-to-understand manner, it provides applied statisticians with the necessary theory, tools, and understanding to conduct complex analyses of continuous and/or discrete correlated data in a longitudinal or clustered data setting. Using numerous and complex examples, the book emphasizes real-world

applications where the underlying model requires a nonlinear rather than linear formulation and compares and contrasts the various estimation techniques for both marginal and mixed-effects models. The SAS procedures MIXED, GENMOD, GLIMMIX, and NLMIXED as well as user-specified macros will be used extensively in these applications. In addition, the book provides detailed software code with most examples so that readers can begin applying the various techniques immediately. This book is part of the SAS Press program.

Generalized Linear and Nonlinear Models for Correlated Data

Mathematical Asset Management

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 Research with Latent Variables

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.

Hierarchical Modelling of Discrete Longitudinal Data

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.

Quantitative Longitudinal Data Analysis

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.

Handbook of Cognitive Aging

Discrete longitudinal data are common in various disciplines and are often used to assess the change over time of one or several outcomes, and/or what covariates might be associated with the outcomes. Existing parametric and nonparametric/semiparametric models typically attribute the heterogeneity across subjects and/or through time to the effects of included explanatory variables or the effect of omitted variables that do not vary across subjects and over time. This dissertation focuses on developing new flexible semiparametric models for discrete longitudinal data using Dirichlet processes. It consists of three parts. In chapter 2 we propose a semiparametric Bayesian framework for the analysis of associations among multivariate longitudinal categorical variables in high-dimensional data settings. This type of data is frequent, especially in the social and behavioral sciences. A semiparametric hierarchical factor analysis model is developed in which the distributions of the factors are modeled nonparametrically through a dynamic Dirichlet process. A Markov chain Monte Carlo algorithm is developed for fitting the model, and the methodology is applied to study the dynamics of public attitudes toward science and technology in the United States over the period 1992-2001. In chapter 3 we consider the estimation of nonparametric regression for binary longitudinal data. Instead of assuming a parametric link function, we specify the joint distribution of the covariates and the latent variable underlying the binary outcome as a multivariate normal with subject and time-specific mean vector and covariance matrix. We then modeled the distribution of these parameters nonparametrically using a dynamic Dirichlet process. The resulting binary regression model is a finite mixture of probit regressions and a nonlinear regression. The proposed model is more flexible than the existing models in that it models the relationship between the binary response and the covariates nonparametrically while at the same time allowing the shape of the relationship to change over time. The methodology is illustrated using simulated data and a real dataset, the data on labor force participation of married women in the US over the period 1979 to 1992. Finally, chapter 4 proposes two functional generalized linear models where the response variables are discrete functional data and one of the covariates is also functional. Functional regression is combined with penalized B-splines in a semiparametric Bayesian framework to jointly estimate the response model and the predictor curves, clustering curves with similar shapes. The methodology is applied to study the price and bids arrivals dynamics in online auctions using data for the palm M515 Personal Digital Assistant (PDA) units from eBay.com.

Linear and Generalized Linear Mixed Models and Their

Applications

Nonparametric Regression Methods for Longitudinal Data Analysis

"Provides a unique perspective. I am particularly impressed with the sections on innovative design and methods to investigate cognitive aging and the integrative perspectives. None of the existing texts covers this material to the same level." —Donna J. La Voie, Saint Louis University "The emphasis on integrating the literature with theoretical and methodological innovations could have a far-reaching impact on the field." —Deb McGinnis, Oakland University The Handbook of Cognitive Aging: Interdisciplinary Perspectives clarifies the differences in patterns and processes of cognitive aging. Along with a comprehensive review of current research, editors Scott M. Hofer and Duane F. Alwin provide a solid foundation for building a multidisciplinary agenda that will stimulate further rigorous research into these complex factors. Key Features Gathers the widest possible range of perspectives by including cognitive aging experts in various disciplines while maintaining a degree of unity across chapters Examines the limitations of the extant literature, particularly in research design and measurement, and offers new suggestions to guide future research Highlights the broad scope of the field with topics ranging from demography to development to neuroscience, offering the most complete coverage available on cognitive aging

Hierarchical Linear Modeling

Multivariate Generalized Linear Mixed Models Using R presents robust and methodologically sound models for analyzing large and complex data sets, enabling readers to answer increasingly complex research questions. The book applies the principles of modeling to longitudinal data from panel and related studies via the Sabre software package in R.A Un

Dynamic Mixed Models for Familial Longitudinal Data

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.

Applied Logistic Regression

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.

Linear Mixed Models for Longitudinal Data

The book is aimed at applied statisticians, graduate students of statistics, and students and researchers with a strong interest in statistics and data analysis. This second edition is extensively revised, especially those sections relating with Bayesian concepts.

Applied Longitudinal Data Analysis

Since Charles Spearman published his seminal paper on factor analysis in 1904 and Karl Joresk¨ og replaced the observed variables in an econometric structural equation model by latent factors in 1970, causal modelling by means of latent variables has become the standard in the social and behavioural sciences. Indeed, the central va- ables that social and behavioural theories deal with, can hardly ever be identi?ed as observed variables. Statistical modelling has to take account of measurement - rors and invalidities in the observed variables and so address the underlying latent variables. Moreover, during the past decades it has been widely agreed on that serious causal modelling should be based on longitudinal data. It is especially in the ?eld of longitudinal research and analysis, including panel research, that progress has been made in recent years. Many comprehensive panel data sets as, for example, on human development and voting behaviour have become available for analysis. The number of publications based on longitudinal data has increased immensely. Papers with causal claims based on cross-sectional data only experience rejection just for that reason.

Nonlinear Models for Repeated Measurement Data

The First Book Dedicated to This Class of Longitudinal Models Although antedependence 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.

Modeling Nonignorable Missing Data for Clustered Longitudinal Discrete Outcomes

Nonlinear measurement data arise in a wide variety of biological and biomedical applications, such as longitudinal clinical trials, studies of drug kinetics and growth, and the analysis of assay and laboratory data. Nonlinear Models for Repeated Measurement Data provides the first unified development of methods and models for data of this type, with a detailed treatment of inference for the nonlinear mixed effects and its extensions. A particular strength of the book is the inclusion of several detailed case studies from the areas of population pharmacokinetics and pharmacodynamics, immunoassay and bioassay development and the analysis of growth curves.

Applied Longitudinal Data Analysis

In medical research, clinical events along with repeated measurements of a biological or medical outcome are often observed. When the clinical event is only observed in a time window (i.e. is interval censored) or the event only takes place at discrete time points, then the data are referred to as discrete time-to-event data or discrete survival data. In this dissertation, approaches for modeling discrete time-to-event data and jointly modeling both discrete survival data and longitudinal data are reviewed. A predictive nonlinear shared parameter joint model is proposed for discrete time-to-event and longitudinal data. A discrete survival model with frailty and generalized linear mixed model for the longitudinal data are joined to predict the probability of events. This joint model focuses on analysis on discrete time-to-event outcome, taking advantage of repeated measurements, i.e. the probability of event in a time window can be more precisely predicted by incorporating longitudinal measurements. The area under the receive operating characteristic curve (ROC) and other measures, i.e. Brier score, discrimination slope, Gini index, Kolmogorov-Smirnov statistic and Hosmer-Lemeshow goodness of fit test are applied to compare the performance of the shared parameter joint model with a two-step model and a discrete survival model for discrete time. Data from the Kawempe Community Healthy Study (KCHS) motivated this research. In the KCHS, time to tuberculin skin testing (TST) conversion from Tuberculosis (TB) negative to TB positive is the discrete event

time and interest is in predicting TST conversion based on longitudinal measures of immunologic function. The tuberculosis (TB) immunology data are investigated using exploratory analyses. The shared parameter joint model, the two-step model and the discrete time survival model are fitted and compared using this TB immunology data. The characteristics of the shared parameter model, the two-step model and the discrete time survival model are studied using simulations based on the TB data. Results from both the TB data and simulated data show that the shared parameter joint model is superior to other two models according to the discrimination ability.

Multivariate Generalized Linear Mixed Models Using R

Change is constant in everyday life. Infants crawl and then walk, children learn to read and write, teenagers mature in myriad ways, the elderly become frail and forgetful. Beyond these natural processes and events, external forces and interventions instigate and disrupt change: test scores may rise after a coaching course, drug abusers may remain abstinent after residential treatment. By charting changes over time and investigating whether and when events occur, researchers reveal the temporal rhythms of our lives. Applied Longitudinal Data Analysis is a much-needed professional book for empirical researchers and graduate students in the behavioral, social, and biomedical sciences. It offers the first accessible in-depth presentation of two of today's most popular statistical methods: multilevel models for individual change and hazard/survival models for event occurrence (in both discrete- and continuous-time). Using clear, concise prose and real data sets from published studies, the authors take you step by step through complete analyses, from simple exploratory displays that reveal underlying patterns through sophisticated specifications of complex statistical models. Applied Longitudinal Data Analysis offers readers a private consultation session with internationally recognized experts and represents a unique contribution to the literature on quantitative empirical methods. Visit http://www.ats.ucla.edu/stat/examples/alda.htm for: · Downloadable data sets · Library of computer programs in SAS, SPSS, Stata, HLM, MLwiN, and more · Additional material for data analysis

Joint Modeling of Longitudinal and Time-to-Event Data

Change is constant in everyday life. Infants crawl and then walk, children learn to read and write, teenagers mature in myriad ways, the elderly become frail and forgetful. Beyond these natural processes and events, external forces and interventions instigate and disrupt change: test scores may rise after a coaching course, drug abusers may remain abstinent after residential treatment. By charting changes over time and investigating whether and when events occur, researchers reveal the temporal rhythms of our lives. Applied Longitudinal Data Analysis is a much-needed professional book for empirical researchers and graduate students in the behavioral, social, and biomedical sciences. It offers the first accessible in-depth presentation of two of today's most popular statistical methods: multilevel models for individual change and hazard/survival models for event occurrence (in both discrete- and continuous-time). Using clear, concise prose and real data sets from published studies, the authors take you step by step through complete analyses, from simple exploratory displays that reveal underlying patterns through

sophisticated specifications of complex statistical models. Applied Longitudinal Data Analysis offers readers a private consultation session with internationally recognized experts and represents a unique contribution to the literature on quantitative empirical methods. Visit http://www.ats.ucla.edu/stat/examples/alda.htm for: · Downloadable data sets · Library of computer programs in SAS, SPSS, Stata, HLM, MLwiN, and more · Additional material for data analysis

Methods and Applications of Longitudinal Data Analysis

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.

Journal of the American Statistical Association

Praise for the First Edition ". . . [this book] should be on the shelf of everyone interestedin . . . longitudinal data analysis." —Journal of the American Statistical Association Features newly developed topics and applications of theanalysis of longitudinal data Applied Longitudinal Analysis, Second Edition presentsmodern methods for analyzing data from longitudinal studies and nowfeatures the latest state-of-the-art techniques. The bookemphasizes practical, rather than theoretical, aspects of methodsfor the analysis of diverse types of longitudinal data that can beapplied across various fields of study, from the health and medicalsciences to the social and behavioral sciences. The authors incorporate their extensive academic and researchexperience along with various updates that have been made inresponse to reader feedback. The Second Edition features six newlyadded 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 effectsmodels Multiple imputation and inverse probability weightedmethods Smoothing methods for longitudinal data Sample size and power Each chapter presents methods in the setting of applications todata sets drawn from the health sciences. New problem sets havebeen added to many chapters, and a related website features sampleprograms and computer output using SAS, Stata, and R, as well asdata sets and supplemental slides to facilitate a completeunderstanding of the material. With its strong emphasis on multidisciplinary applications andthe interpretation of results, Applied LongitudinalAnalysis, Second Edition is an excellent book for courses onstatistics in the health and medical sciences at theupper-undergraduate and graduate levels. The book also serves as avaluable reference for researchers and professionals in themedical, public health, and pharmaceutical fields as well as thosein social and behavioral sciences who would like to learn moreabout analyzing longitudinal data.

Multivariate Statistical Modelling Based on Generalized Linear Models

First Published in 2012. Routledge is an imprint of Taylor & Francis, an informa company.

Missing Data in Longitudinal Studies

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.

Heavy-tailed Longitudinal Data Modeling Using Copulas

A practical approach to the mathematical tools needed to increase portfolio growth, learn successful trading strategies, and manage the risks associated with market fluctuation Mathematical Asset Management presents an accessible and practical introduction to financial derivatives and portfolio selection while also acting as a basis for further study in mathematical finance. Assuming a fundamental background in calculus, real analysis, and linear algebra, the book uses mathematical tools only as needed and provides comprehensive, yet concise, coverage of various topics, such as: Interest rates and the connection between present value and arbitrage Financial instruments beyond bonds that serve as building blocks for portfolios Trading strategies and risk performance measures Stochastic properties of stock prices The difference between expected return and expected growth and the geometric Brownian motion Diversification through the creation of optimal portfolios under various constraints The use of the Capital Asset Pricing Model to accurately estimate the difference between the return of the market and the short rate To further demonstrate the reality of the discussed concepts, the author analyzes five active stocks over a four-year period and highlights the different methods and portfolios that exist in today's economic world. Exercises are also provided throughout the text, along with the solutions, allowing readers to measure their understanding of presented techniques as well as see how the methods work in real life. Mathematical Asset Management is an excellent book for courses in mathematical finance, actuarial mathematics, financial derivatives, and financial engineering at the upper-undergraduate and graduate levels. It is also a valuable reference for practitioners in banking, insurance, and asset management industries.

Joint Modeling of Longitudinal Data and Discrete-time Survival Outcome with Application to Studying Tuberculosis Immunology Data

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.

Generalized Latent Variable Modeling

This book covers two major classes of mixed effects models, linear mixed models and generalized linear mixed models. It presents an up-to-date account of theory and methods in analysis of these models as well as their applications in various fields. The book offers a systematic approach to inference about non-Gaussian linear mixed models. Furthermore, it includes recently developed methods, such as mixed model diagnostics, mixed model selection, and jackknife method in the context of mixed models. The book is aimed at students, researchers and other practitioners who are interested in using mixed models for statistical data analysis.

Models for Discrete Longitudinal Data

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.

Beyesian Semiparametric Models for Discrete Longitudinal Data

Applied Longitudinal Analysis

This volume describes how to conceptualize, perform, and critique traditional generalized linear models (GLMs) from a Bayesian perspective and how to use modern computational methods to summarize inferences using simulation. Introducing dynamic modeling for GLMs and containing over 1000 references and equations, Generalized Linear Models considers parametric and semiparametric approaches to overdispersed GLMs, presents methods of analyzing correlated binary data using latent variables. It also proposes a semiparametric method to model link functions for binary response data, and identifies areas of important future research and new applications of GLMs.

Nonparametric Regression Methods for Longitudinal Data Analysis

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.

Longitudinal Data Analysis

This book unifies and extends latent variable models, including multilevel or generalized linear mixed models, longitudinal or panel models, item response or factor models, latent class or finite mixture models, and structural equation models. Following a gentle introduction to latent variable modeling, the authors clearly explain and contrast a wi

Generalized Linear Models

Antedependence Models for Longitudinal Data

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.

Latent Markov Models for Longitudinal Data

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.

Analysis of Longitudinal Data

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.

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