Bayesian Semiparametric Inference in Multiple Equation Models

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ABSTRACT: This paper outlines an approach to Bayesian semiparametric regression in multiple equation models which can be used to carry out inference in seemingly unrelated regressions or simultaneous equations models with nonparametric components. The approach treats the points on each nonparametric regression line as unknown parameters and uses a prior on the degree of smoothness of each line to ensure valid posterior inference despite the fact that the number of parameters is greater than the number of observations. We derive an empirical Bayesian approach that allows us to estimate the prior smoothing hyperparameters from the data. An advantage of our semiparametric model is that it is written as a seemingly unrelated regressions model with independent Normal-Wishart prior. Since this model is a common one, textbook results for posterior inference, model comparisons, prediction and posterior computation are immediately available. We use this model in an application involving a two-equation structural model drawn from the labor and returns to schooling literatures.

Bayesian Semiparametric Structural Equation Models With

Rosina Ehmann

Bayesian Semiparametric Structural Equation Models With:

 Basic and Advanced Bayesian Structural Equation Modeling Sik-Yum Lee,Xin-Yuan Song,2012-07-05 This book provides clear instructions to researchers on how to apply Structural Equation Models SEMs for analyzing the inter relationships between observed and latent variables Basic and Advanced Bayesian Structural Equation Modeling introduces basic and advanced SEMs for analyzing various kinds of complex data such as ordered and unordered categorical data multilevel data mixture data longitudinal data highly non normal data as well as some of their combinations In addition Bayesian semiparametric SEMs to capture the true distribution of explanatory latent variables are introduced whilst SEM with a nonparametric structural equation to assess unspecified functional relationships among latent variables are also explored Statistical methodologies are developed using the Bayesian approach giving reliable results for small samples and allowing the use of prior information leading to better statistical results Estimates of the parameters and model comparison statistics are obtained via powerful Markov Chain Monte Carlo methods in statistical computing Introduces the Bayesian approach to SEMs including discussion on the selection of prior distributions and data augmentation Demonstrates how to utilize the recent powerful tools in statistical computing including but not limited to the Gibbs sampler the Metropolis Hasting algorithm and path sampling for producing various statistical results such as Bayesian estimates and Bayesian model comparison statistics in the analysis of basic and advanced SEMs Discusses the Bayes factor Deviance Information Criterion DIC and L_ nu measure for Bayesian model comparison Introduces a number of important generalizations of SEMs including multilevel and mixture SEMs latent curve models and longitudinal SEMs semiparametric SEMs and those with various types of discrete data and nonparametric structural equations Illustrates how to use the freely available software WinBUGS to produce the results Provides numerous real examples for illustrating the theoretical concepts and computational procedures that are presented throughout the book Researchers and advanced level students in statistics biostatistics public health business education psychology and social science will benefit from this book   *Structural Equation Modeling* Gregory R. Hancock,Ralph O. Mueller,2013-03-21 This second edition updates Hancock and Mueller s 2006 volume adding four new chapters It serves as a resource for graduate students and research professionals covering advanced topics in structural equation modeling SEM to enhance understanding and explore new research questions with a focus on clear explanations and applications   <u>Bayesian Non- and Semi-parametric Methods and Applications</u> Peter Rossi,2014-04-27 This book reviews and develops Bayesian non parametric and semi parametric methods for applications in microeconometrics and quantitative marketing Most econometric models used in microeconomics and marketing applications involve arbitrary distributional assumptions As more data becomes available a natural desire to provide methods that relax these assumptions arises Peter Rossi advocates a Bayesian approach in which specific distributional assumptions are replaced with more flexible distributions based on mixtures of normals The Bayesian approach can use either a large but fixed number of normal

components in the mixture or an infinite number bounded only by the sample size By using flexible distributional approximations instead of fixed parametric models the Bayesian approach can reap the advantages of an efficient method that models all of the structure in the data while retaining desirable smoothing properties Non Bayesian non parametric methods often require additional ad hoc rules to avoid overfitting in which resulting density approximates are nonsmooth With proper priors the Bayesian approach largely avoids overfitting while retaining flexibility This book provides methods for assessing informative priors that require only simple data normalizations The book also applies the mixture of the normals approximation method to a number of important models in microeconometrics and marketing including the non parametric and semi parametric regression models instrumental variables problems and models of heterogeneity In addition the author has written a free online software package in R bayesm which implements all of the non parametric models discussed in the book   Issues in Psychology and Psychiatry Research and Practice: 2012 Edition ,2013-01-10 Issues in Psychology and Psychiatry Research and Practice 2012 Edition is a ScholarlyEditions eBook that delivers timely authoritative and comprehensive information about Psychology The editors have built Issues in Psychology and Psychiatry Research and Practice 2012 Edition on the vast information databases of ScholarlyNews You can expect the information about Psychology in this eBook to be deeper than what you can access anywhere else as well as consistently reliable authoritative informed and relevant The content of Issues in Psychology and Psychiatry Research and Practice 2012 Edition has been produced by the world s leading scientists engineers analysts research institutions and companies All of the content is from peer reviewed sources and all of it is written assembled and edited by the editors at ScholarlyEditions and available exclusively from us You now have a source you can cite with authority confidence and credibility More information is available at http www ScholarlyEditions com   **Issues in Bioengineering and Bioinformatics: 2013 Edition** ,2013-05-01 Issues in Bioengineering and Bioinformatics 2013 Edition is a ScholarlyEditions book that delivers timely authoritative and comprehensive information about Lifetime Data Analysis The editors have built Issues in Bioengineering and Bioinformatics 2013 Edition on the vast information databases of ScholarlyNews You can expect the information about Lifetime Data Analysis in this book to be deeper than what you can access anywhere else as well as consistently reliable authoritative informed and relevant The content of Issues in Bioengineering and Bioinformatics 2013 Edition has been produced by the world s leading scientists engineers analysts research institutions and companies All of the content is from peer reviewed sources and all of it is written assembled and edited by the editors at ScholarlyEditions and available exclusively from us You now have a source you can cite with authority confidence and credibility More information is available at http www ScholarlyEditions com   **Longitudinal Multivariate Psychology** Emilio Ferrer,Steven M. Boker,Kevin J. Grimm,2018-10-09 This volume presents a collection of chapters focused on the study of multivariate change As people develop and change multivariate measurement of that change and analysis of those measures can illuminate the regularities

in the trajectories of individual development as well as time dependent changes in population averages As longitudinal data have recently become much more prevalent in psychology and the social sciences models of change have become increasingly important This collection focuses on methodological statistical and modeling aspects of multivariate change and applications of longitudinal models to the study of psychological processes The volume is divided into three major sections Extension of latent change models Measurement and testing issues in longitudinal modeling and Novel applications of multivariate longitudinal methodology It is intended for advanced students and researchers interested in learning about state of the art techniques for longitudinal data analysis as well as understanding the history and development of such techniques

Structural Equation Modeling Sik-Yum Lee,2007-04-04 Winner of the 2008 Ziegel Prize for outstanding new book of the year Structural equation modeling SEM is a powerful multivariate method allowing the evaluation of a series of simultaneous hypotheses about the impacts of latent and manifest variables on other variables taking measurement errors into account As SEMs have grown in popularity in recent years new models and statistical methods have been developed for more accurate analysis of more complex data A Bayesian approach to SEMs allows the use of prior information resulting in improved parameter estimates latent variable estimates and statistics for model comparison as well as offering more reliable results for smaller samples Structural Equation Modeling introduces the Bayesian approach to SEMs including the selection of prior distributions and data augmentation and offers an overview of the subject s recent advances Demonstrates how to utilize powerful statistical computing tools including the Gibbs sampler the Metropolis Hasting algorithm bridge sampling and path sampling to obtain the Bayesian results Discusses the Bayes factor and Deviance Information Criterion DIC for model comparison Includes coverage of complex models including SEMs with ordered categorical variables and dichotomous variables nonlinear SEMs two level SEMs multisample SEMs mixtures of SEMs SEMs with missing data SEMs with variables from an exponential family of distributions and some of their combinations Illustrates the methodology through simulation studies and examples with real data from business management education psychology public health and sociology Demonstrates the application of the freely available software WinBUGS via a supplementary website featuring computer code and data sets Structural Equation Modeling A Bayesian Approach is a multi disciplinary text ideal for researchers and students in many areas including statistics biostatistics business education medicine psychology public health and social science *Bayesian Non-linear Methods for Survival Analysis and Structural Equation Models* Zhenyu Wang (Statistician),2014 High dimensional data are more common nowadays because the collection of such data becomes larger and more complex due to the technology advance of the computer science biology etc The analysis of high dimensional data is different from traditional data analysis and variable selection for high dimensional data becomes very challenging Structural equation modeling SEM analyzes the relationship between manifest variables and latent variables The structural equation focuses on analyzing the relationship between latent variables New proposed methods of these topics are discussed

in the dissertation In the first chapter we review the basic concept of survival analysis SEM and current method of variable selection in those two scenarios We also introduce the available software package for current methods and relevant data set In the second chapter we develop a Bayesian kernel machine model with incorporating existing information on pathways and gene networks in the analysis of DNA microarray data Each pathway is modeled nonparametrically using reproducing kernel Hilbert space The pathways and the genes are selected via assigning mixture priors on the pathway indicator variable and the gene indicator variable This approach helped us in flexible modeling of the pathway effects which can capture both linear and non linear effect Moreover the model can also pinpoint the important pathways and the important active genes within each pathway We have also developed an efficient Markov Chain Monte Carlo MCMC algorithm to fit our model We used simulations and a real data analysis van t Veer et al 2002 breast cancer microarray data to illustrate the proposed method In the third chapter we extend the idea of semiparametric structural equation model where the nonlinear functional relationships are approximated using basis expansions Guo et al 2012 Many basis expansion methods including cubic splines are known to induce correlations In this chapter we compare standard Lasso Fused Lasso and Elastic Net to account for correlations in both the covariate and basis expansions To illustrate the usefulness of the proposed methods a simulation study and a real data study have been performed The semiparametric structural equation models based on Bayesian fused Lasso and Bayesian elastic net outperform the Bayesian Lasso model In the fourth chapter we apply Bayesian Graph Laplacian Model developed by Liu et al 2014 and generalized the graph Laplacian allowing both positively and negatively correlated variable to analyze gene expression data from Michigan prostate cancer study Dhanasekaran et al 2001 We find out the underlie gene network and interaction related to prostate cancer and discuss the possible extensions for Bayesian Graph Laplacian Model including analyzing multiple pathways simultaneously and pathways selection right censored data as response variable and binomial or multinomial data as response variable   **Consumer Behavior in the Internet Era** Gong Sun,Lester Johnson,Jie Li,2022-11-28   **Bayesian Statistics and Its Applications** Satyanshu K. Upadhyay,Umesh Singh,Dipak Dey,2007 In the last two decades Bayesian Statistics has acquired immense importance and has penetrated almost every area including those where the application of statistics appeared to be a remote possibility This volume provides both theoretical and practical insights into the subject with detailed up to date material on various aspects It serves two important objectives to offer a thorough background material for theoreticians and gives a variety of applications for applied statisticians and practitioners Consisting of 33 chapters it covers topics on biostatistics econometrics reliability image analysis Bayesian computation neural networks prior elicitation objective Bayesian methodologies role of randomisation in Bayesian analysis spatial data analysis nonparametrics and a lot more The book will serve as an excellent reference work for updating knowledge and for developing new methodologies in a wide variety of areas It will become an invaluable tool for statisticians and the practitioners of Bayesian paradigm   **American Doctoral Dissertations** ,2000   **Journal of the**

American Statistical Association American Statistical Association,2007 *Current Index to Statistics, Applications, Methods and Theory* ,1999 The Current Index to Statistics CIS is a bibliographic index of publications in statistics probability and related fields Bayesian Econometrics Gary Koop,2003 Researchers in many fields are increasingly finding the Bayesian approach to statistics to be an attractive one This book introduces the reader to the use of Bayesian methods in the field of econometrics at the advanced undergraduate or graduate level The book is self contained and does not require that readers have previous training in econometrics The focus is on models used by applied economists and the computational techniques necessary to implement Bayesian methods when doing empirical work Topics covered in the book include the regression model and variants applicable for use with panel data time series models models for qualitative or censored data nonparametric methods and Bayesian model averaging The book includes numerous empirical examples and the website associated with it contains data sets and computer programs to help the student develop the computational skills of modern Bayesian econometrics *Mathematical Reviews* ,2006 Latent Variable Models for Multiple Longitudinal Outcomes with Non-ignorable Missing Data Xiaohong Yan,2007 **Statistical Theory and Method Abstracts** ,1997 **JMR, Journal of Marketing Research** ,2003 *Business Periodicals Index* ,2000 *International Encyclopedia of the Social & Behavioral Sciences* Neil J. Smelser,Paul B. Baltes,2001 The largest work ever published in the social and behavioural sciences It contains 4000 signed articles 15 million words of text 90 000 bibliographic references and 150 biographical entries

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