

Parsimonious Skew Mixture Models For Model Based

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To ensure simplicity and parsimony in presentation, we do not show these results, but the models are available upon request. Finally, we ran the two second-stage logit models on our main dependent ...

This volume conveys some of the surprises, puzzles and success stories in high-dimensional and complex data analysis and related fields. Its peer-reviewed contributions showcase recent advances in variable selection, estimation and prediction strategies for a host of useful models, as well as essential new developments in the field. The continued and rapid advancement of modern technology now allows scientists to collect data of increasingly unprecedented size and complexity. Examples include epigenomic data, genomic data, proteomic data, high-resolution image data, high-frequency financial data, functional and longitudinal data, and network data. Simultaneous variable selection and estimation is one of the key statistical problems involved in analyzing such big and complex data. The purpose of this book is to stimulate research and foster interaction between researchers in the area of high-dimensional data analysis. More concretely, its goals are to: 1) highlight and expand the breadth of existing methods in big data and high-dimensional data analysis and their potential for the advancement of both the mathematical and statistical sciences; 2) identify important directions for future research in the theory of regularization methods, in algorithmic development, and in methodologies for different application areas; and 3) facilitate collaboration between theoretical and subject-specific researchers.

"This is a great overview of the field of model-based clustering and classification by one of its leading developers. McNicholas provides a resource that I am certain will be used by researchers in statistics and related disciplines for quite some time. The discussion of mixtures with heavy tails and asymmetric distributions will place this text as the authoritative, modern reference in the mixture modeling literature." (Douglas Steinley, University of Missouri) Mixture Model-Based Classification is the first monograph devoted to mixture model-based approaches to clustering and classification. This is both a book for established researchers and newcomers to the field. A history of mixture models as a tool for classification is provided and Gaussian mixtures are considered extensively, including mixtures of factor analyzers and other approaches for high-dimensional data. Non-Gaussian mixtures are considered, from mixtures with components that parameterize skewness and/or concentration, right up to mixtures of multiple scaled distributions. Several other important topics are considered, including mixture approaches for clustering and classification of longitudinal data as well as discussion about how to define a cluster Paul D. McNicholas is the Canada Research Chair in Computational Statistics at McMaster University, where he is a Professor in the Department of Mathematics and Statistics. His research focuses on the use of mixture model-based approaches for classification, with particular attention to clustering applications, and he has published extensively within the field. He is an associate editor for several journals and has served as a guest editor for a number of special issues on mixture models.

This book focuses on the latest developments in behaviorometrics and data science, covering a wide range of topics in data analysis and related areas of data science, including analysis of complex data, analysis of qualitative data, methods for high-dimensional data, dimensionality reduction, visualization of such data, multivariate statistical methods, analysis of asymmetric relational data, and various applications to real data. In addition to theoretical and methodological results, it also shows how to apply the proposed methods to a variety of problems, for example in consumer behavior, decision making, marketing data, and social network structures. Moreover, it discusses methodological aspects and applications in a wide range of areas, such as behaviorometrics, behavioral science, psychology, and marketing, management and social sciences. Combining methodological advances with real-world applications collected from a variety of research fields, the book is a valuable resource for researchers and practitioners, as well as for applied statisticians and data analysts.

The purpose of this book is to thoroughly prepare the reader for applied research in clustering. Cluster analysis comprises a class of statistical techniques for classifying multivariate data into groups or clusters based on their similar features. Clustering is nowadays widely used in several domains of research, such as social sciences, psychology, and marketing, highlighting its multidisciplinary nature. This book provides an accessible and comprehensive introduction to clustering and offers practical guidelines for applying clustering tools by carefully chosen real-life datasets and extensive data analyses. The procedures addressed in this book include traditional hard clustering methods and up-to-date developments in soft clustering. Attention is paid to practical examples and applications through the open source statistical software R. Commented R code and output for conducting, step by step, complete cluster analyses are available. The book is intended for researchers interested in applying clustering methods. Basic notions on theoretical issues and on R are provided so that professionals as well as novices with little or no background in the subject will benefit from the book.

Mixture models have been around for over 150 years, and they are found in many branches of statistical modelling, as a versatile and multifaceted tool. They can be applied to a wide range of data: univariate or multivariate, continuous or categorical, cross-sectional, time series, networks, and much more. Mixture analysis is a very active research topic in statistics and machine learning, with new developments in methodology and applications taking place all the time. The Handbook of Mixture Analysis is a very timely publication, presenting a broad overview of the methods and applications of this important field of research. It covers a wide array of topics, including the EM algorithm, Bayesian mixture models, model-based clustering, high-dimensional data, hidden Markov models, and applications in finance, genomics, and astronomy. Features: Provides a comprehensive overview of the methods and applications of mixture modelling and analysis Divided into three parts: Foundations and Methods; Mixture Modelling and Extensions; and Selected Applications Contains many worked examples using real data, together with computational implementation, to illustrate the methods described Includes contributions from the leading researchers in the field The Handbook of Mixture Analysis is targeted at graduate students and young researchers new to the field. It will also be an important reference for anyone working in this field, whether they are developing new methodology, or applying the models to real scientific problems.

Cluster analysis finds groups in data automatically. Most methods have been heuristic and leave open such central questions as: how many clusters are there? Which method should I use? How should I handle outliers? Classification assigns new observations to groups given previously classified observations, and also has open questions about parameter tuning, robustness and uncertainty assessment. This book frames cluster analysis and classification in terms of statistical models, thus yielding principled estimation, testing and prediction methods, and sound answers to the central questions. It builds the basic ideas in an accessible but rigorous way, with extensive data examples and R code; describes modern approaches to high-dimensional data and networks; and explains such recent advances as Bayesian regularization, non-Gaussian model-based clustering, cluster merging, variable selection, semi-supervised and robust classification, clustering of functional data, text and images, and co-clustering. Written for advanced undergraduates in data science, as well as researchers and practitioners, it assumes basic knowledge of multivariate calculus, linear algebra, probability and statistics.

The papers in this book cover issues related to the development of novel statistical models for the analysis of data. They offer solutions for relevant problems in statistical data analysis and contain the explicit derivation of the proposed models as well as their implementation. The book assembles the selected and refereed proceedings of the biannual conference of the Italian Classification and Data Analysis Group (CLADAG), a section of the Italian Statistical Society.

This book of peer-reviewed contributions presents the latest findings in classification, statistical learning, data analysis and related areas, including supervised and unsupervised classification, clustering, statistical analysis of mixed-type data, big data analysis, statistical modeling, graphical models and social networks. It covers both methodological aspects as well as applications to a wide range of fields such as economics, architecture, medicine, data management, consumer behavior and the gender gap. In addition, it describes the basic features of the software behind the data analysis results, and provides links to the corresponding codes and data sets where necessary. This book is intended for researchers and practitioners who are interested in the latest developments and applications in the field of data analysis and classification. It gathers selected and peer-reviewed contributions presented at the 11th Scientific Meeting of the Classification and Data Analysis Group of the Italian Statistical Society (CLADAG 2017), held in Milan, Italy, on September 13 – 15, 2017.

Quantitative Methods in HIV/AIDS Research provides a comprehensive discussion of modern statistical approaches for the analysis of HIV/AIDS data. The first section focuses on statistical issues in clinical trials and epidemiology that are unique to or particularly challenging in HIV/AIDS research; the second section focuses on the analysis of laboratory data used for immune monitoring, biomarker discovery and vaccine development; the final section focuses on statistical issues in the mathematical modeling of HIV/AIDS pathogenesis, treatment and epidemiology. This book brings together a broad perspective of new quantitative methods in HIV/AIDS research, contributed by statisticians and mathematicians immersed in HIV research, many of whom are current or previous leaders of CFAR quantitative cores. It is the editors' hope that the work will inspire more statisticians, mathematicians and computer scientists to collaborate and contribute to the interdisciplinary challenges of understanding and addressing the AIDS pandemic.

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