


Jie Chen and A.K. Gupta

PARAMETRIC STATISTICAL CHANGE POINT ANALYSIS



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Parametric Statistical Change Point Analysis

**Andriëtte Bekker, Johannes T.
Ferreira, Mohammad Arashi, Ding-Geng
Chen**



Parametric Statistical Change Point Analysis:

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Parametric Statistical Change Point Analysis Jie Chen,Anil Kumar Gupta,2000-06-15 Recently there has been a keen interest in the statistical analysis of change point detection and estimation. Mainly it is because change point problems can be encountered in many disciplines such as economics, finance, medicine, psychology, geology, literature etc and even in our daily lives. From the statistical point of view, a change point is a place or time point such that the observations follow one distribution up to that point and follow another distribution after that point. Multiple change points problem can also be defined similarly. So the change point's problem is two fold: one is to decide if there is any change, often viewed as a hypothesis testing problem; another is to locate the change point when there is a change present, often viewed as an estimation problem. The earliest change point study can be traced back to the 1950s. During the following period of some forty years, numerous articles have been published in various journals and proceedings. Many of them cover the topic of single change point in the means of a sequence of independently normally distributed random variables. Another popularly covered topic is a change point in regression models such as linear regression and autoregression. The methods used are mainly likelihood ratio, nonparametric and Bayesian. Few authors also considered the change point problem in other model settings such as the gamma and exponential.

Change Point Analysis Baisuo Jin,Jialiang Li,2025-08-29 Change point analysis is a crucial statistical technique for detecting structural breaks within datasets, applicable in diverse fields such as finance and weather forecasting. The authors of this book aim to consolidate recent advancements and broaden the scope beyond traditional time series applications to include biostatistics, longitudinal data analysis, high dimensional data and network analysis. The book introduces foundational concepts with practical data examples from literature alongside

discussions of related machine learning topics Subsequent chapters focus on mathematical tools for single and multiple change point detection along with statistical inference issues which provide rigorous proofs to enhance understanding but assume readers have foundational knowledge in graduate level probability and statistics The book also expands the discussion into threshold regression frameworks linked to subgroup identification in modern statistical learning and apply change point analysis to functional data and dynamic networks areas not comprehensively covered elsewhere

Key Features

Comprehensive Coverage of Diverse Applications This book expands the scope of change point analysis to include biostatistics longitudinal data high dimensional data and network analysis This broad applicability makes it a valuable resource for researchers and students across various disciplines

Integration of Theory and Practice The book balances rigorous mathematical theory with practical applications by providing extensive computational examples using R Each chapter features real world data illustrations and discussions of relevant machine learning topics ensuring that readers can see the relevance of theoretical concepts in applied settings

Accessibility for Students The content is designed with graduate level students in mind providing clear explanations and structured guidance through complex mathematical tools

Rigorous proofs are included to facilitate understanding without overwhelming readers with overly advanced theories early on

The book incorporates computational results using R showcasing various packages tailored for specific methods or problem domains while providing references for further exploration

By offering a selection of widely adopted methodologies relevant in scientific research as well as business contexts this text aims to equip junior researchers with essential tools needed for their work in change point analysis

Parametric Statistical Change Point Analysis Jie Chen, Anil Kumar Gupta, 2014-01-15

Parametric Statistical Change Point Analysis, 2011-11-01

[Change-Point Analysis in Nonstationary Stochastic Models](#)

Boris Brodsky, 2016-12-12 This book covers the development of methods for detection and estimation of changes in complex systems These systems are generally described by nonstationary stochastic models which comprise both static and dynamic regimes linear and nonlinear dynamics and constant and time variant structures of such systems It covers both retrospective and sequential problems particularly theoretical methods of optimal detection Such methods are constructed and their characteristics are analyzed both theoretically and experimentally Suitable for researchers working in change point analysis and stochastic modelling the book includes theoretical details combined with computer simulations and practical applications Its rigorous approach will be appreciated by those looking to delve into the details of the methods as well as those looking to apply them

Innovations in Multivariate Statistical Modeling Andriëtte Bekker, Johannes T. Ferreira, Mohammad Arashi, Ding-Geng Chen, 2022-12-15 Multivariate statistical analysis has undergone a rich and varied evolution during the latter half of the 20th century Academics and practitioners have produced much literature with diverse interests and with varying multidisciplinary knowledge on different topics within the multivariate domain Due to multivariate algebra being of sustained interest and being a continuously developing field its appeal breaches laterally across multiple disciplines to act as

a catalyst for contemporary advances with its core inferential genesis remaining in that of statistics. It is exactly this varied evolution caused by an influx in data production, diffusion and understanding in scientific fields that has blurred many lines between disciplines. The cross-pollination between statistics and biology, engineering, medical science, computer science and even art has accelerated the vast amount of questions that statistical methodology has to answer and report on. These questions are often multivariate in nature, hoping to elucidate uncertainty on more than one aspect at the same time and it is here where statistical thinking merges mathematical design with real-life interpretation for understanding this uncertainty. Statistical advances benefit from these algebraic inventions and expansions in the multivariate paradigm. This contributed volume aims to usher novel research emanating from a multivariate statistical foundation into the spotlight with particular significance in multidisciplinary settings. The overarching spirit of this volume is to highlight current trends, stimulate a focus on and connect multidisciplinary dots from and within multivariate statistical analysis. Guided by these thoughts, a collection of research at the forefront of multivariate statistical thinking is presented here, which has been authored by globally recognized subject matter experts.

Non-Parametric Statistical Diagnosis E. Brodsky, B.S. Darkhovsky, 2013-03-14. This book has a distinct philosophy and it is appropriate to make it explicit at the outset. In our view, almost all classic statistical inference is based upon the assumption, explicit or implicit, that there exists a fixed probabilistic mechanism of data generation. Unlike classic statistical inference, this book is devoted to the statistical analysis of data about complex objects with more than one probabilistic mechanism of data generation. We think that the existence of more than one data generation process (DGP) is the most important characteristic of complex systems. When the hypothesis of statistical homogeneity holds true, i.e., there exists only one mechanism of data generation, all statistical inference is based upon the fundamental laws of large numbers. However, the situation is completely different when the probabilistic law of data generation can change in time or in the phase space. In this case, all data obtained must be sorted in subsamples generated by different probabilistic mechanisms. Only after such classification can we make correct inferences about all DGPs. There exists yet another type of problem for complex systems. Here it is important to detect possible but unpredictable changes of DGPs on-line with data collection. Since the complex system can change the probabilistic mechanism of data generation, the correct statistical analysis of such data must begin with decisions about possible changes in DGPs.

Research Papers in Statistical Inference for Time Series and Related Models Yan Liu, Junichi Hirukawa, Yoshihide Kakizawa, 2023-05-31. This book compiles theoretical developments on statistical inference for time series and related models in honor of Masanobu Taniguchi's 70th birthday. It covers models such as long-range dependence models, nonlinear conditionally heteroscedastic time series, locally stationary processes, integer-valued time series, Levy Processes, complex-valued time series, categorical time series, exclusive topic models and copula models. Many cutting-edge methods such as empirical likelihood methods, quantile regression, portmanteau tests, rank-based inference, change point detection, testing for the goodness of fit, higher-order

asymptotic expansion minimum contrast estimation optimal transportation and topological methods are proposed considered or applied to complex data based on the statistical inference for stochastic processes The performances of these methods are illustrated by a variety of data analyses This collection of original papers provides the reader with comprehensive and state of the art theoretical works on time series and related models It contains deep and profound treatments of the asymptotic theory of statistical inference In addition many specialized methodologies based on the asymptotic theory are presented in a simple way for a wide variety of statistical models This Festschrift finds its core audiences in statistics signal processing and econometrics **Bayesian Time Series Models** David Barber,A. Taylan Cemgil,Silvia Chiappa,2011-08-11 The first unified treatment of time series modelling techniques spanning machine learning statistics engineering and computer science

Advanced Mathematical And Computational Tools In Metrology And Testing X Franco Pavese,Wolfram Bremser,Anna G Chunovkina,Nicolas Fischer,Alistair B Forbes,2015-04-22 This volume contains original and refereed contributions from the tenth AMCTM Conference www.nviim.ru AMCTM2014 held in St Petersburg Russia in September 2014 on the theme of advanced mathematical and computational tools in metrology and testing The themes in this volume reflect the importance of the mathematical statistical and numerical tools and techniques in metrology and testing and also keeping the challenge promoted by the Metre Convention to access a mutual recognition for the measurement standards Data Stream Mining & Processing Sergii Babichev,Dmytro Peleshko,Olena Vynokurova,2020-11-04 This book constitutes the proceedings of the third International Conference on Data Stream and Mining and Processing DSMP 2020 held in Lviv Ukraine in August 2020 The 36 full papers presented in this volume were carefully reviewed and selected from 134 submissions The papers are organized in topical sections of hybrid systems of computational intelligence machine vision and pattern recognition dynamic data mining big data data science using intelligent approaches The conference was held virtually due to the COVID 19 pandemic **Robustness and Complex Data Structures** Claudia Becker,Roland Fried,Sonja Kuhnt,2014-07-08 This

Festschrift in honour of Ursula Gather s 60th birthday deals with modern topics in the field of robust statistical methods especially for time series and regression analysis and with statistical methods for complex data structures The individual contributions of leading experts provide a textbook style overview of the topic supplemented by current research results and questions The statistical theory and methods in this volume aim at the analysis of data which deviate from classical stringent model assumptions which contain outlying values and or have a complex structure Written for researchers as well as master and PhD students with a good knowledge of statistics **Asymptotic Methods in Stochastics** Lajos Horvath and Barbara Szyszkowicz, Honoring over forty years of Miklos Csorgo s work in probability and statistics this title shows the state of the research This book covers such topics as path properties of stochastic processes weak convergence of random size sums almost sure stability of weighted maxima and procedures for detecting changes in statistical models *Anomaly-Detection and Health-Analysis Techniques for Core Router Systems* Shi Jin,Zhaobo Zhang,Krishnendu Chakrabarty,Xinli Gu,2019-12-19

This book tackles important problems of anomaly detection and health status analysis in complex core router systems integral to today's Internet Protocol IP networks. The techniques described provide the first comprehensive set of data driven resiliency solutions for core router systems. The authors present an anomaly detector for core router systems using correlation based time series analysis which monitors a set of features of a complex core router system. They also describe the design of a changepoint based anomaly detector such that anomaly detection can be adaptive to changes in the statistical features of data streams. The presentation also includes a symbol based health status analyzer that first encodes as a symbol sequence the long term complex time series collected from a number of core routers and then utilizes the symbol sequence for health analysis. Finally the authors describe an iterative self learning procedure for assessing the health status. Enables Accurate Anomaly Detection Using Correlation Based Time Series Analysis. Presents the design of a changepoint based anomaly detector. Includes Hierarchical Symbol based Health Status Analysis. Describes an iterative self learning procedure for assessing the health status.

Applied Data-Centric Social Sciences Aki-Hiro Sato, 2014-07-29 Applied data centric social sciences aim to develop both methodology and practical applications of various fields of social sciences and businesses with rich data. Specifically in the social sciences a vast amount of data on human activities may be useful for understanding collective human nature. In this book the author introduces several mathematical techniques for handling a huge volume of data and analysing collective human behaviour. The book is constructed from data oriented investigation with mathematical methods and expressions used for dealing with data for several specific problems. The fundamental philosophy underlying the book is that both mathematical and physical concepts are determined by the purposes of data analysis. This philosophy is shown throughout exemplar studies of several fields in socio economic systems. From a data centric point of view the author proposes a concept that may change people's minds and cause them to start thinking from the basis of data. Several goals underlie the chapters of the book. The first is to describe mathematical and statistical methods for data analysis and toward that end the author delineates methods with actual data in each chapter. The second is to find a cyber physical link between data and data generating mechanisms as data are always provided by some kind of data generating process in the real world. The third goal is to provide an impetus for the concepts and methodology set forth in this book to be applied to socio economic systems.

Challenges in Automation, Robotics and Measurement Techniques Roman Szewczyk, Cezary Zieliński, Małgorzata Kaliczyńska, 2016-02-15 This book presents the set of papers accepted for presentation at the International Conference Automation held in Warsaw 2-4 March of 2016. It presents the research results presented by top experts in the fields of industrial automation control robotics and measurement techniques. Each chapter presents a thorough analysis of a specific technical problem which is usually followed by numerical analysis simulation and description of results of implementation of the solution of a real world problem. The presented theoretical results practical solutions and guidelines will be valuable for both researchers working in the area of engineering sciences and for practitioners solving industrial

problems *Stochastic Models, Statistics and Their Applications* Ansgar Steland, Ewaryst Rafajłowicz, Ostap Okhrin, 2019-10-15 This volume presents selected and peer reviewed contributions from the 14th Workshop on Stochastic Models Statistics and Their Applications held in Dresden Germany on March 6 8 2019 Addressing the needs of theoretical and applied researchers alike the contributions provide an overview of the latest advances and trends in the areas of mathematical statistics and applied probability and their applications to high dimensional statistics econometrics and time series analysis statistics for stochastic processes statistical machine learning big data and data science random matrix theory quality control change point analysis and detection finance copulas survival analysis and reliability sequential experiments empirical processes and microsimulations As the book demonstrates stochastic models and related statistical procedures and algorithms are essential to more comprehensively understanding and solving present day problems arising in e g the natural sciences machine learning data science engineering image analysis genetics econometrics and finance *Artificial Intelligence in Medicine* Annette ten Teije, Christian Popow, John H. Holmes, Lucia Sacchi, 2017-06-12 This book constitutes the refereed proceedings of the 16th Conference on Artificial Intelligence in Medicine AIME 2017 held in Vienna Austria in June 2017 The 21 revised full and 23 short papers presented were carefully reviewed and selected from 113 submissions The papers are organized in the following topical sections ontologies and knowledge representation Bayesian methods temporal methods natural language processing health care processes and machine learning and a section with demo papers

Empirical Economic and Financial Research Jan Beran, Yuanhua Feng, Hartmut Hebbel, 2014-11-07 The purpose of this book is to establish a connection between the traditional field of empirical economic research and the emerging area of empirical financial research and to build a bridge between theoretical developments in these areas and their application in practice Accordingly it covers broad topics in the theory and application of both empirical economic and financial research including analysis of time series and the business cycle different forecasting methods new models for volatility correlation and of high frequency financial data and new approaches to panel regression as well as a number of case studies Most of the contributions reflect the state of art on the respective subject The book offers a valuable reference work for researchers university instructors practitioners government officials and graduate and post graduate students as well as an important resource for advanced seminars in empirical economic and financial research

Parametric Statistical Change Point Analysis Book Review: Unveiling the Power of Words

In some sort of driven by information and connectivity, the ability of words has become more evident than ever. They have the capability to inspire, provoke, and ignite change. Such is the essence of the book **Parametric Statistical Change Point Analysis**, a literary masterpiece that delves deep into the significance of words and their impact on our lives. Published by a renowned author, this captivating work takes readers on a transformative journey, unraveling the secrets and potential behind every word. In this review, we will explore the book's key themes, examine its writing style, and analyze its overall impact on readers.

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