

SEMI-MARKOV MODELS

Theory and Applications

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Semi Markov Models Theory And Applications

Dmitrii Silvestrov, Sergei Silvestrov



Semi Markov Models Theory And Applications:

Semi-Markov Models Jacques Janssen, 2013-11-11 This book is the result of the International Symposium on Semi Markov Processes and their Applications held on June 4-7 1984 at the Universite Libre de Bruxelles with the help of the FNRS Fonds National de la Recherche Scientifique Belgium the Ministere de l'Education Nationale Belgium and the Bernoulli Society for Mathematical Statistics and Probability This international meeting was planned to make a state of the art for the area of semi Markov theory and its applications to bring together researchers in this field and to create a platform for open and thorough discussion Main themes of the Symposium are the first ten sections of this book The last section presented here gives an exhaustive bibliography on semi Markov processes for the last ten years Papers selected for this book are all invited papers and in addition some contributed papers retained after strong refereeing Sections are I Markov additive processes and regenerative systems II Semi Markov decision processes III Algorithmic and computer oriented approach IV Semi Markov models in economy and insurance V Semi Markov processes and reliability theory VI Simulation and statistics for semi Markov processes VII Semi Markov processes and queueing theory VIII Branching IX Applications in medicine X Applications in other fields v PREFACE XI A second bibliography on semi Markov processes It is interesting to quote that sections IV to X represent a good sample of the main applications of semi Markov processes i.e. Semi-Markov Models and Applications Jacques Janssen, Nikolaos Limnios, 2013-12-01 This book presents a selection of papers presented to the Second International Symposium on Semi Markov Models Theory and Applications held in Compiègne France in December 1998 This international meeting had the same aim as the first one held in Brussels in 1984 to make fourteen years later the state of the art in the field of semi Markov processes and their applications bring together researchers in this field and also to stimulate fruitful discussions The set of the subjects of the papers presented in Compiègne has a lot of similarities with the preceding Symposium this shows that the main fields of semi Markov processes are now well established particularly for basic applications in Reliability and Maintenance Biomedicine Queueing Control processes and production A growing field is the one of insurance and finance but this is not really a surprising fact as the problem of pricing derivative products represents now a crucial problem in economics and finance For example stochastic models can be applied to financial and insurance models as we have to evaluate the uncertainty of the future market behavior in order firstly to propose different measures for important risks such as the interest risk the risk of default or the risk of catastrophe and secondly to describe how to act in order to optimize the situation in time Recently the concept of VaR Value at Risk was discovered in portfolio theory enlarging so the fundamental model of Markowitz Hidden Semi-Markov Models Shun-Zheng Yu, 2015-10-22 Hidden semi Markov models HSMMs are among the most important models in the area of artificial intelligence machine learning Since the first HSMM was introduced in 1980 for machine recognition of speech three other HSMMs have been proposed with various definitions of duration and observation distributions Those models have different expressions

algorithms computational complexities and applicable areas without explicitly interchangeable forms Hidden Semi Markov Models Theory Algorithms and Applications provides a unified and foundational approach to HSMMs including various HSMMs such as the explicit duration variable transition and residential time of HSMMs inference and estimation algorithms implementation methods and application instances Learn new developments and state of the art emerging topics as they relate to HSMMs presented with examples drawn from medicine engineering and computer science Discusses the latest developments and emerging topics in the field of HSMMs Includes a description of applications in various areas including Human Activity Recognition Handwriting Recognition Network Traffic Characterization and Anomaly Detection and Functional MRI Brain Mapping Shows how to master the basic techniques needed for using HSMMs and how to apply them

Applied Semi-Markov Processes Jacques Janssen,Raimondo Manca,2006-02-08 Aims to give to the reader the tools necessary to apply semi Markov processes in real life problems The book is self contained and starting from a low level of probability concepts gradually brings the reader to a deep knowledge of semi Markov processes Presents homogeneous and non homogeneous semi Markov processes as well as Markov and semi Markov rewards processes The concepts are fundamental for many applications but they are not as thoroughly presented in other books on the subject as they are here

Theory and Applications of Time Series Analysis Olga Valenzuela,Fernando Rojas,Luis Javier Herrera,Héctor Pomares,Ignacio Rojas,2023-11-09 This book presents the latest developments in the theory and applications of time series analysis and forecasting Comprising a selection of refereed papers it is divided into several parts that address modern theoretical aspects of time series analysis forecasting and prediction with applications to various disciplines including econometrics and energy research The broad range of topics discussed including matters of particular relevance for sustainable development will give readers a modern perspective on the subject The included contributions were originally presented at the 8th International Conference on Time Series and Forecasting ITISE 2022 held in Gran Canaria Spain June 27 30 2022 The ITISE conference series provides a forum for scientists engineers educators and students to discuss the latest advances and implementations in the foundations theory models and applications of time series analysis and forecasting It focuses on interdisciplinary research encompassing computer science mathematics statistics and econometrics

Semi-Markov Risk Models for Finance, Insurance and Reliability Jacques Janssen,Raimondo Manca,2007-05-15 This book aims to give a complete and self contained presentation of semi Markov models with finitely many states in view of solving real life problems of risk management in three main fields Finance Insurance and Reliability providing a useful complement to our first book Janssen and Manca 2006 which gives a theoretical presentation of semi Markov theory However to help assure the book is self contained the first three chapters provide a summary of the basic tools on semi Markov theory that the reader will need to understand our presentation For more details we refer the reader to our first book Janssen and Manca 2006 whose notations definitions and results have been used in these four first chapters Nowadays the

potential for theoretical models to be used on real life problems is severely limited if there are no good computer programs to process the relevant data We therefore systematically propose the basic algorithms so that effective numerical results can be obtained Another important feature of this book is its presentation of both homogeneous and non homogeneous models It is well known that the fundamental structure of many real life problems is non homogeneous in time and the application of homogeneous models to such problems gives in the best case only approximated results or in the worst case nonsense results

Introduction to Hidden Semi-Markov Models John van der Hoeek, Robert J. Elliott, 2018-02-08 Markov chains and hidden Markov chains have applications in many areas of engineering and genomics This book provides a basic introduction to the subject by first developing the theory of Markov processes in an elementary discrete time finite state framework suitable for senior undergraduates and graduates The authors then introduce semi Markov chains and hidden semi Markov chains before developing related estimation and filtering results Genomics applications are modelled by discrete observations of these hidden semi Markov chains This book contains new results and previously unpublished material not available elsewhere The approach is rigorous and focused on applications *Semi-Markov Chains and Hidden Semi-Markov Models toward Applications* Vlad Stefan Barbu, Nikolaos Limnios, 2009-01-07 Here is a work that adds much to the sum of our knowledge in a key area of science today It is concerned with the estimation of discrete time semi Markov and hidden semi Markov processes A unique feature of the book is the use of discrete time especially useful in some specific applications where the time scale is intrinsically discrete The models presented in the book are specifically adapted to reliability studies and DNA analysis The book is mainly intended for applied probabilists and statisticians interested in semi Markov chains theory reliability and DNA analysis and for theoretical oriented reliability and bioinformatics engineers Probability and Statistical Models with Applications CH. A. Charalambides, M.V. Koutras, N. Balakrishnan, 2000-09-21 This monograph of carefully collected articles reviews recent developments in theoretical and applied statistical science highlights current noteworthy results and illustrates their applications and points out possible new directions to pursue With its enlightening account of statistical discoveries and its numerous figures and tables Probabili Nonlinearly Perturbed Semi-Markov Processes Dmitrii Silvestrov, Sergei Silvestrov, 2017-09-06 The book presents new methods of asymptotic analysis for nonlinearly perturbed semi Markov processes with a finite phase space These methods are based on special time space screening procedures for sequential phase space reduction of semi Markov processes combined with the systematical use of operational calculus for Laurent asymptotic expansions Effective recurrent algorithms are composed for getting asymptotic expansions without and with explicit upper bounds for remainders for power moments of hitting times stationary and conditional quasi stationary distributions for nonlinearly perturbed semi Markov processes These results are illustrated by asymptotic expansions for birth death type semi Markov processes which play an important role in various applications The book will be a useful contribution to the continuing intensive studies in the area It is an essential reference for theoretical

and applied researchers in the field of stochastic processes and their applications that will contribute to continuing extensive studies in the area and remain relevant for years to come

Mathematical Methods in Queuing Theory Vladimir V. Kalashnikov, 2013-04-18 The material of this book is based on several courses which have been delivered for a long time at the Moscow Institute for Physics and Technology Some parts have formed the subject of lectures given at various universities throughout the world Freie Universitat of Berlin Chalmers University of Technology and the University of Goteborg University of California at Santa Barbara and others The subject of the book is the theory of queues This theory as a mathematical discipline begins with the work of A Erlang who examined a model of a telephone station and obtained the famous formula for the distribution of the number of busy lines which is named after him Queueing theory has been applied to the study of numerous models emergency aid road traffic computer systems etc Besides it has lead to several related disciplines such as reliability and inventory theories which deal with similar models Nevertheless many parts of the theory of queues were developed as a pure science with no practical applications The aim of this book is to give the reader an insight into the mathematical methods which can be used in queueing theory and to present examples of solving problems with the help of these methods Of course the choice of the methods is quite subjective Thus many prominent results have not even been mentioned

Athens Conference on Applied Probability and Time Series Analysis C.C. Heyde, Yu.V. Prohorov, Ronald Pyke, S.T. Rachev, 2012-12-06 The Athens Conference on Applied Probability and Time Series in 1995 brought together researchers from across the world The published papers appear in two volumes Volume I includes papers on applied probability in Honor of J M Gani The topics include probability and probabilistic methods in recursive algorithms and stochastic models Markov and other stochastic models such as Markov chains branching processes and semi Markov systems biomathematical and genetic models epidemiological models including S I R Susceptible Infective Removal household and AIDS epidemics financial models for option pricing and optimization problems random walks queues and their waiting times and spatial models for earthquakes and inference on spatial models

Flowgraph Models for Multistate Time-to-Event Data Aparna V. Huzurbazar, 2004-12-03 A unique introduction to the innovative methodology of statistical flowgraphs This book offers a practical application based approach to flowgraph models for time to event data It clearly shows how this innovative new methodology can be used to analyze data from semi Markov processes without prior knowledge of stochastic processes opening the door to interesting applications in survival analysis and reliability as well as stochastic processes Unlike other books on multistate time to event data this work emphasizes reliability and not just biostatistics illustrating each method with medical and engineering examples It demonstrates how flowgraphs bring together applied probability techniques and combine them with data analysis and statistical methods to answer questions of practical interest Bayesian methods of data analysis are emphasized Coverage includes Clear instructions on how to model multistate time to event data using flowgraph models An emphasis on computation real data and Bayesian methods for problem solving Real

world examples for analyzing data from stochastic processes The use of flowgraph models to analyze complex stochastic networks Exercise sets to reinforce the practical approach of this volume Flowgraph Models for Multistate Time to Event Data is an invaluable resource reference for researchers in biostatistics survival analysis systems engineering and in fields that use stochastic processes including anthropology biology psychology computer science and engineering *Data Analysis from Statistical Foundations* Donald Alexander Stuart Fraser, A. K. Md. Ehsanes Saleh, 2001 Data Analysis from Statistical Foundations *Distributed Computer and Communication Networks* Vladimir M. Vishnevskiy, Konstantin E. Samouylov, Dmitry V. Kozyrev, 2019-12-17 This book constitutes the refereed proceedings of the 22nd International Conference on Distributed and Computer and Communication Networks DCCN 2019 held in Moscow Russia in September 2019 The 44 full papers and 2 short papers were carefully reviewed and selected from 174 submissions The papers cover the following topics Computer and Communication Networks Analytical Modeling of Distributed Systems and Distributed Systems Applications *Perturbed Semi-Markov Type Processes I* Dmitrii Silvestrov, 2022-03-25 This book is the first volume of a two volume monograph devoted to the study of limit and ergodic theorems for regularly and singularly perturbed Markov chains semi Markov processes and multi alternating regenerative processes with semi Markov modulation The first volume presents necessary and sufficient conditions for weak convergence for first rare event times and convergence in the topology J for first rare event processes defined on regularly perturbed finite Markov chains and semi Markov processes The text introduces new asymptotic recurrent algorithms of phase space reduction It also addresses both effective conditions of weak convergence for distributions of hitting times as well as convergence of expectations of hitting times for regularly and singularly perturbed finite Markov chains and semi Markov processes The book also contains a comprehensive bibliography of major works in the field It provides an effective reference for both graduate students as well as theoretical and applied researchers studying stochastic processes and their applications **Saddlepoint Approximations with Applications** Ronald W. Butler, 2007-08-16 Modern statistical methods use complex sophisticated models that can lead to intractable computations Saddlepoint approximations can be the answer Written from the user's point of view this book explains in clear language how such approximate probability computations are made taking readers from the very beginnings to current applications The core material is presented in chapters 1-6 at an elementary mathematical level Chapters 7-9 then give a highly readable account of higher order asymptotic inference Later chapters address areas where saddlepoint methods have had substantial impact multivariate testing stochastic systems and applied probability bootstrap implementation in the transform domain and Bayesian computation and inference No previous background in the area is required Data examples from real applications demonstrate the practical value of the methods Ideal for graduate students and researchers in statistics biostatistics electrical engineering econometrics and applied mathematics this is both an entry level text and a valuable reference **Documentation Abstracts**, 1986 Coupling and Ergodic Theorems for Semi-Markov-Type

Processes I Dmitrii Silvestrov, 2025-10-26 Ergodic theorems are a cornerstone of the theory of stochastic processes and their applications This volume delves into ergodic theorems with explicit power and exponential upper bounds for convergence rates focusing on Markov chains renewal processes and regenerative processes The book offers a powerful and constructive probabilistic framework by employing the elegant coupling method in conjunction with test functions Theoretical findings are illustrated with applications to perturbed stochastic networks alternating Markov processes risk processes quasi stationary distributions and the renewal theorem all of which feature explicit convergence rate bounds Many results presented here are groundbreaking appearing in publication for the first time This is the first volume of a two volume monograph dedicated to ergodic theorems While this volume centers on Markovian and regenerative models the second volume extends the scope to semi Markov processes and multi alternating regenerative processes with semi Markov modulation Designed with researchers and advanced students in mind the content is thoughtfully structured by complexity making it suitable for self study or as a resource for upper level coursework Each chapter is self contained and complemented by a comprehensive bibliography ensuring its value as a long lasting reference An essential resource for theoretical and applied research this book significantly contributes to the field of stochastic processes and will remain a key reference for years to come

Mathematical and Statistical Models and Methods in Reliability V.V. Rykov, N. Balakrishnan, M.S.

Nikulin, 2010-11-02 The book is a selection of invited chapters all of which deal with various aspects of mathematical and statistical models and methods in reliability Written by renowned experts in the field of reliability the contributions cover a wide range of applications reflecting recent developments in areas such as survival analysis aging lifetime data analysis artificial intelligence medicine carcinogenesis studies nuclear power financial modeling aircraft engineering quality control and transportation Mathematical and Statistical Models and Methods in Reliability is an excellent reference text for researchers and practitioners in applied probability and statistics industrial statistics engineering medicine finance transportation the oil and gas industry and artificial intelligence

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