An Introduction To Markov Chains Mit Mathematics

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Numerical Methods for Structured Markov Chains Geo Abstracts Limited
Papers presented at a workshop held January 1990 (location unspecified) cover just about all aspects of solving Markov models numerically. There are papers on matrix generation techniques and generalized stochastic Petri nets; the computation of stationary distributions, including aggregation/disagg
Introduction to Probability CRC Press
New up-to-date edition of this influential classic on Markov chains in general state spaces. Proofs are rigorous and concise, the range of applications is broad and knowledgeable, and key ideas are accessible to practitioners with limited mathematical background. New commentary by Sean Meyn, including updated references, reflects developments since 1996.
An Introduction to Stochastic Modeling Springer Science & Business Media
An introduction to stochastic processes through the use of R Introduction to Stochastic Processes with R is an accessible and well-balanced presentation of the theory of stochastic processes, with an emphasis on real-world applications of probability theory in the natural and social sciences. The use of simulation, by means of the popular statistical freeware R, makes theoretical results come alive with practical, hands-on demonstrations. Written by a highly-qualified expert in the field, the author presents numerous examples from a wide array of disciplines, which are used to illustrate concepts and highlight computational and theoretical results. Developing readers' problem-solving skills and mathematical maturity, Introduction to Stochastic Processes with R features: Over 200 examples and 600 end-of-chapter exercises A tutorial for getting started with R, and appendices that contain review material in probability and matrix algebra Discussions of many timely and interesting supplemental topics including Markov chain Monte Carlo, random walk on graphs, card shuffling, Black-Scholes options pricing, applications in biology and genetics, cryptography, martingales, and stochastic calculus Introductions to mathematics as needed in order to suit readers at many mathematical levels A companion website that includes relevant data files as well as all R code and scripts used throughout the book Introduction to Stochastic Processes with R is an ideal textbook for an introductory course in stochastic processes. The book is aimed at undergraduate and beginning graduate-level students in the science, technology, engineering, and mathematics disciplines. The book is also an excellent reference for applied mathematicians and statisticians who are interested in a review of the topic.
Introduction to Ergodic rates for Markov chains and processes Springer Science & Business Media
This book is an introduction to the modern theory of Markov chains, whose goal is to determine the rate of convergence to the stationary distribution, as a function of state space size and geometry. This topic has important connections to combinatorics, statistical physics, and theoretical computer science. Many of the techniques presented originate in these disciplines. The central tools for estimating convergence times, including coupling, strong stationary times, and spectral methods, are developed. The authors discuss many examples, including card shuffling and the Ising model, from statistical mechanics, and present the connection of random walks to electrical networks and apply it to estimate hitting and cover times. The first edition has been used in courses in mathematics and computer science departments of numerous universities. The second edition features three new chapters (on monotone chains, the exclusion process, and stationary times) and also includes smaller additions and corrections throughout. Updated notes at the end of each chapter inform the reader of recent research developments.
Markov Chains and Mixing Times River Publishers Signal, Image
A cornerstone of applied probability, Markov chains can be used to help model how plants grow, chemicals react, and atoms diffuse--and applications are increasingly being found in such areas as engineering, computer science, economics, and education. To apply the techniques to real problems, however, it is necessary to understand how Markov chains can be solved numerically. In this book, the first to offer a systematic and detailed treatment of the numerical solution of Markov chains, William Stewart provides scientists on many levels with the power to put this theory to use in the actual world, where it has applications in areas as diverse as engineering, economics, and education. His efforts make for essential reading in a rapidly growing field. Here Stewart explores all aspects of numerically computing solutions of Markov chains, especially when the state is huge. He provides extensive background to both discrete-time and continuous-time Markov chains and examines many different numerical computing methods--direct, single-and multi-vector iterative, and projection methods. More specifically, he considers recursive methods often used when the structure of the Markov chain is upper Hessenberg, iterative aggregation/disaggregation methods that are particularly appropriate when it is NCD (nearly completely decomposable), and reduced schemes for cases in which the chain is periodic. There are chapters on methods for computing transient solutions, on stochastic automata networks, and, finally, on currently available software. Throughout Stewart draws on numerous examples and comparisons among the methods he so thoroughly explains.
Gibbs Fields, Monte Carlo Simulation, and Queues John Wiley & Sons
Markov Models This book will offer you an insight into the Hidden Markov Models as well as the Bayesian Networks. Additionally, by reading this book, you will also learn algorithms such as Markov Chain Sampling. Furthermore, this book will also teach you how Markov Models are very relevant when a decision problem is associated with a risk that continues over time, when the timing of occurrences is vital as well as when events occur more than once. This book highlights several applications of Markov Models. Lastly, after purchasing this book, you will need to put in a lot of effort and time for you to reap the maximum benefits. By Downloading This Book Now You Will Discover: Hidden Markov Models Dynamic Bayesian Networks Stepwise Mutations using the Wright Fisher Model Using Normalized Algorithms to Update the Formulas Types of Markov Processes Important Tools used with HMM Machine Learning And much much more! Download this book now and learn more about Markov Models!
Markov Models Courier Corporation
This is the revised and augmented edition of a now classic book which is an introduction to sub-Markovian kernels on general measurable spaces and their associated homogeneous Markov chains. The first part, an expository text on the foundations of the subject, is intended for post-graduate students. A study of potential theory, the basic classification of chains according to their asymptotic behaviour and the celebrated Chacon-Ornstein theorem are examined in detail. The second part of the book is at a more advanced level and includes a treatment of random walks on general locally compact abelian groups. Further chapters develop renewal theory, an introduction to Martin boundary and the study of chains recurrent in the Harris sense. Finally, the last chapter deals with the construction of chains starting from a kernel satisfying some kind of maximum principle.
Introduction to Stochastic Processes with R Cambridge University Press
This book provides an undergraduate-level introduction to discrete and continuous-time Markov chains and their applications, with a particular focus on the first step analysis technique and its applications to average hitting times and ruin probabilities. It also discusses classical topics such as recurrence and transience, stationary and limiting distributions, as well as branching processes. It first examines in detail two important examples (gambling processes and random walks) before presenting the general theory itself in the subsequent chapters. It also provides an introduction to discrete-time martingales and their relation to ruin probabilities and mean exit times, together with a chapter on spatial Poisson processes. The concepts presented are illustrated by examples, 138 exercises and 9 problems with their solutions.
Performance Modeling of Communication Networks with Markov Chains Princeton University Press
A fascinating and instructive guide to Markov chains for experienced users and newcomers alike This unique guide to Markov chains approaches the subject along the four convergent lines of mathematics, implementation, simulation, and experimentation. It introduces readers to the art of stochastic modeling, shows how to design computer implementations, and provides extensive worked examples with case studies. Markov Chains: From Theory to Implementation and Experimentation begins with a general introduction to the history of probability theory in which the author uses quantifiable examples to illustrate how probability theory arrived at the concept of discrete-time and the Markov model from experiments involving independent variables. An introduction to simple stochastic matrices and transition probabilities is followed by a simulation of a two-state Markov chain. The notion of steady state is explored in connection with the long-run distribution behavior of the Markov chain. Predictions based on Markov chains with more than two states are examined, followed by a discussion of the notion of absorbing Markov chains. Also covered in detail are topics relating to the average time spent in a state, various chain configurations, and n-state Markov chain simulations used for verifying experiments involving various diagram configurations. • Fascinating historical notes shed light on the key ideas that led to the development of the Markov model and its variants • Various configurations of Markov Chains and their limitations are explored at length • Numerous examples—from basic to complex—are presented in a comparative manner using a variety of color graphics • All algorithms presented can be analyzed in either Visual Basic, Java Script, or PHP • Designed to be useful to professional statisticians as well as readers without extensive knowledge of probability theory Covering both the theory underlying the Markov model and an array of Markov chain implementations, within a common conceptual framework, Markov Chains: From Theory to Implementation and Experimentation is a stimulating introduction to and a valuable reference for those wishing to deepen their understanding of this extremely valuable statistical tool. Paul A. Gagniuc, PhD, is Associate Professor at Polytechnic University of Bucharest, Romania. He obtained his MS and his PhD in genetics at the University of Bucharest. Dr. Gagniuc's work has been published in numerous high profile scientific journals, ranging from the Public Library of Science to BioMed Central and Nature journals. He is the recipient of several awards for exceptional scientific results and a highly active figure in the review process for different scientific areas.
Continuous Time Markov Processes Vieweg+Teubner Verlag
Intersecting two large research areas - numerical analysis and applied probability/queuing theory - this book is a self-contained introduction to the numerical solution of structured Markov chains, which have a wide applicability in queuing theory and stochastic modeling and include M/G/1 and GI/M/1-type Markov chain, quasi-birth-death processes, non-skip free queues and tree-like stochastic processes. Written for applied probabilists and numerical analysts, but accessible toengineers and scientists working on telecommunications and evaluation of computer systems performances, it provides a systematic treatment of the theory and algorithms for important families of structured Markov chains and a thorough overview of the current literature.The book, consisting of nine Chapters, is presented in three parts. Part 1 covers a basic description of the fundamental concepts related to Markov chains, a systematic treatment of the structure matrix tools, including finite Toeplitz matrices, displacement operators, FFT, and the infinite block Toeplitz matrices, their relationship with matrix power series and the fundamental problems of solving matrix equations and computing

canonical factorizations. Part 2 deals with the description andanalysis of structure Markov chains and includes M/G/1, quasi-birth-death processes, non-skip-free queues and tree-like processes. Part 3 covers solution algorithms where new convergence and applicability results are proved. Each chapter ends with bibliographic notes for further reading, and the bookends with an appendix collecting the main general concepts and results used in the book, a list of the main annotations and algorithms used in the book, and an extensive index.

Introduction to the Numerical Solution of Markov Chains Springer

The aim of this book volume is to explain the importance of Markov state models to molecular simulation, how they work, and how they can be applied to a range of problems. The Markov state model (MSM) approach aims to address two key challenges of molecular simulation: 1) How to reach long timescales using short simulations of detailed molecular models. 2) How to systematically gain insight from the resulting sea of data. MSMs do this by providing a compact representation of the vast conformational space available to biomolecules by decomposing it into states sets of rapidly interconverting conformations and the rates of transitioning between states. This kinetic definition allows one to easily vary the temporal and spatial resolution of an MSM from high-resolution models capable of quantitative agreement with (or prediction of) experiment to low-resolution models that facilitate understanding. Additionally, MSMs facilitate the calculation of quantities that are difficult to obtain from more direct MD analyses, such as the ensemble of transition pathways. This book introduces the mathematical foundations of Markov models, how they can be used to analyze simulations and drive efficient simulations, and some of the insights these models have yielded in a variety of applications of molecular simulation.

Markov Chains: Models, Algorithms and Applications Universitätsverlag Potsdam

Primarily an introduction to the theory of stochastic processes at the undergraduate or beginning graduate level, the primary objective of this book is to initiate students in the art of stochastic modelling. However it is motivated by significant applications and progressively brings the student to the borders of contemporary research. Examples are from a wide range of domains, including operations research and electrical engineering. Researchers and students in these areas as well as in physics, biology and the social sciences will find this book of interest.

The Mathematical Basis of Performance Modeling CRC Press

This book is an introduction to the modern approach to the theory of Markov chains. The main goal of this approach is to determine the rate of convergence of a Markov chain to the stationary distribution as a function of the size and geometry of the state space. The authors develop the key tools for estimating convergence times, including coupling, strong stationary times, and spectral methods. Whenever possible, probabilistic methods are emphasized. The book includes many examples and provides brief introductions to some central models of statistical mechanics. Also provided are accounts of random walks on networks, including hitting and cover times, and analyses of several methods of shuffling cards. As a prerequisite, the authors assume a modest understanding of probability theory and linear algebra at an undergraduate level. Markov Chains and Mixing Times is meant to bring the excitement of this active area of research to a wide audience.

Introduction to Markov Chains John Wiley & Sons

Besides the investigation of general chains the book contains chapters which are concerned with eigenvalue techniques, conductance, stopping times, the strong Markov property, couplings, strong uniform times, Markov chains on arbitrary finite groups (including a crash-course in harmonic analysis), random generation and counting, Markov random fields, Gibbs fields, the Metropolis sampler, and simulated annealing. With 170 exercises.

An Introduction to Markov Processes Oxford University Press on Demand

Markov chains are central to the understanding of random processes. This is not only because they pervade the applications of random processes, but also because one can calculate explicitly many quantities of interest. This textbook, aimed at advanced undergraduate or MSc students with some background in basic probability theory, focuses on Markov chains and quickly develops a coherent and rigorous theory whilst showing also how actually to apply it. Both discrete-time and continuous-time chains are studied. A distinguishing feature is an introduction to more advanced topics such as martingales and potentials in the established context of Markov chains. There are applications to simulation, economics, optimal control, genetics, queues and many other topics, and exercises and examples drawn both from theory and practice. It will therefore be an ideal text either for elementary courses on random processes or those that are more oriented towards applications.

An Introduction to Markov State Models and Their Application to Long Timescale Molecular Simulation Springer Science & Business Media

Self-contained treatment covers both theory and applications. Topics include the fundamental role of homogeneous infinite Markov chains in the mathematical modeling of psychology and genetics. 1980 edition.

Numerical Solution of Markov Chains Steven Taylor

Clear presentation employs methods that recognize computer-related aspects of theory. Topics include expectations and independence, Bernoulli processes and sums of independent random variables, Markov chains, renewal theory, more. 1975 edition.

Introduction to Markov chains CRC Press

For students in pure and applied probability; lots of applications, fairly self-contained.

Finite Markov Processes and Their Applications American Mathematical Soc.

Developed from celebrated Harvard statistics lectures, Introduction to Probability provides essential language and tools for understanding statistics, randomness, and uncertainty. The book explores a wide variety of applications and examples, ranging from coincidences and paradoxes to Google PageRank and Markov chain Monte Carlo (MCMC). Additional

with applications to limit theorems Cambridge University Press

In this 2002 book, the author develops the necessary background in probability theory and Markov chains then discusses important computing applications.