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Srinivas R. Chakravarthy

Markov Chains Springer:

    Understanding Markov Chains Nicolas Privault,2018-08-03 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 **Markov Chains** Randal Douc,Eric Moulines,Pierre Priouret,Philippe Soulier,2018-12-11 This book covers the classical theory of Markov chains on general state spaces as well as many recent developments The theoretical results are illustrated by simple examples many of which are taken from Markov Chain Monte Carlo methods The book is self contained while all the results are carefully and concisely proven Bibliographical notes are added at the end of each chapter to provide an overview of the literature Part I lays the foundations of the theory of Markov chain on general states space Part II covers the basic theory of irreducible Markov chains on general states space relying heavily on regeneration techniques These two parts can serve as a text on general state space applied Markov chain theory Although the choice of topics is quite different from what is usually covered where most of the emphasis is put on countable state space a graduate student should be able to read almost all these developments without any mathematical background deeperthan that needed to study countable state space very little measure theory is required Part III covers advanced topics on the theory of irreducible Markov chains The emphasis is on geometric and subgeometric convergence rates and also on computable bounds Some results appeared for a first time in a book and others are original Part IV are selected topics on Markov chains covering mostly hot recent developments **Markov Chains** Pierre Bremaud,2013-03-09 In this book the author begins with the elementary theory of Markov chains and very progressively brings the reader to the more advanced topics He gives a useful review of probability that makes the book self contained and provides an appendix with detailed proofs of all the prerequisites from calculus algebra and number theory A number of carefully chosen problems of varying difficulty are proposed at the close of each chapter and the mathematics are slowly and carefully developed in order to make self study easier The author treats the classic topics of Markov chain theory both in discrete time and continuous time as well as the connected topics such as finite Gibbs fields nonhomogeneous Markov chains discrete time regenerative processes Monte Carlo simulation simulated annealing and queuing theory The result is an up to date textbook on stochastic processes Students and researchers in operations research and electrical engineering as well as in physics and biology will find it very accessible and relevant **Continuous-Time Markov Chains** William J. Anderson,2012-12-06 Continuous time parameter

Markov chains have been useful for modeling various random phenomena occurring in queueing theory genetics demography epidemiology and competing populations This is the first book about those aspects of the theory of continuous time Markov chains which are useful in applications to such areas It studies continuous time Markov chains through the transition function and corresponding q matrix rather than sample paths An extensive discussion of birth and death processes including the Stieltjes moment problem and the Karlin McGregor method of solution of the birth and death processes and multidimensional population processes is included and there is an extensive bibliography Virtually all of this material is appearing in book form for the first time *Markov Chains* Pierre Brémaud,2020-05-23 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 <u>Markov Chains</u> David Freedman,1983 *Approximating Countable Markov Chains* David Freedman,2012-12-06 A long time ago I started writing a book about Markov chains Brownian motion and diffusion I soon had two hundred pages of manuscript and my publisher was enthusiastic Some years and several drafts later I had a thousand pages of manuscript and my publisher was less enthusiastic So we made it a trilogy Markov Chains Brownian Motion and Diffusion Approximating Countable Markov Chains familiarly MC B if you can follow Sections 10 4 to 10 9 of Markov Chains you re in The first two books are quite independent of one another and completely independent of this one which is a monograph explaining one way to think about chains with instantaneous states The results here are supposed to be new except when there are specific disclaimers It s written in the framework of Markov chains we wanted to reprint in this volume the MC chapters needed for reference but this proved impossible Most of the proofs in the trilogy are new and I tried hard to make them explicit The old ones were often elegant but I seldom saw what made them go With my own I can sometimes show you why things work And as I will argue in a minute my demonstrations are easier technically If I wrote them down well enough you may come to agree <u>Stochastic Processes and Calculus Explained</u> Vikas Rathi,2025-02-20 Stochastic Processes and Calculus Explained is an essential textbook designed to help readers understand and apply stochastic processes across various fields Written in clear accessible language this book provides a solid foundation in probability theory and calculus while diving into stochastic processes including random variables probability distributions Brownian motion stochastic integration and stochastic differential equations We emphasize the practical relevance of these concepts in finance physics engineering and biology Our guide illustrates how stochastic processes model uncertainty and randomness aiding in informed decision making outcome prediction and complex system analysis With real world examples and exercises we ensure readers can grasp and apply these concepts effectively The book offers a strong mathematical

foundation covering key tools and techniques such as probability theory calculus and linear algebra essential for understanding stochastic processes Catering to readers of all backgrounds and expertise levels Stochastic Processes and Calculus Explained is ideal for beginners and experienced practitioners alike Its clear explanations intuitive coverage and comprehensive approach make it an invaluable resource for students researchers and professionals worldwide

Introduction to Matrix Analytic Methods in Queues 1 Srinivas R. Chakravarthy,2022-08-19 Matrix analytic methods MAM were introduced by Professor Marcel Neuts and have been applied to a variety of stochastic models since In order to provide a clear and deep understanding of MAM while showing their power this book presents MAM concepts and explains the results using a number of worked out examples This book s approach will inform and kindle the interest of researchers attracted to this fertile field To allow readers to practice and gain experience in the algorithmic and computational procedures of MAM Introduction to Matrix Analytic Methods in Queues 1 provides a number of computational exercises It also incorporates simulation as another tool for studying complex stochastic models especially when the state space of the underlying stochastic models under analytic study grows exponentially The book s detailed approach will make it more accessible for readers interested in learning about MAM in stochastic models **Inference in Hidden Markov Models** Olivier Cappé,Eric Moulines,Tobias Rydén,2005-08-04 This book is a comprehensive treatment of inference for hidden Markov models including both algorithms and statistical theory Topics range from filtering and smoothing of the hidden Markov chain to parameter estimation Bayesian methods and estimation of the number of states In a unified way the book covers both models with finite state spaces and models with continuous state spaces also called state space models requiring approximate simulation based algorithms that are also described in detail Many examples illustrate the algorithms and theory This book builds on recent developments to present a self contained view Probability With a View Towards Statistics, Volume II J. Hoffman-Jorgensen,2017-11-22 Volume II of this two volume text and reference work concentrates on the applications of probability theory to statistics e g the art of calculating densities of complicated transformations of random vectors exponential models consistency of maximum estimators and asymptotic normality of maximum estimators It also discusses topics of a pure probabilistic nature such as stochastic processes regular conditional probabilities strong Markov chains random walks and optimal stopping strategies in random games Unusual topics include the transformation theory of densities using Hausdorff measures the consistency theory using the upper definition function and the asymptotic normality of maximum estimators using twice stochastic differentiability With an emphasis on applications to statistics this is a continuation of the first volume though it may be used independently of that book Assuming a knowledge of linear algebra and analysis as well as a course in modern probability Volume II looks at statistics from a probabilistic point of view touching only slightly on the practical computation aspects Financial Data Analytics with Machine Learning, Optimization and Statistics Sam Chen,Ka Chun Cheung,Phillip Yam,2024-10-21 An essential introduction to data analytics and Machine

Learning techniques in the business sector In Financial Data Analytics with Machine Learning Optimization and Statistics a team consisting of a distinguished applied mathematician and statistician experienced actuarial professionals and working data analysts delivers an expertly balanced combination of traditional financial statistics effective machine learning tools and mathematics The book focuses on contemporary techniques used for data analytics in the financial sector and the insurance industry with an emphasis on mathematical understanding and statistical principles and connects them with common and practical financial problems Each chapter is equipped with derivations and proofs especially of key results and includes several realistic examples which stem from common financial contexts The computer algorithms in the book are implemented using Python and R two of the most widely used programming languages for applied science and in academia and industry so that readers can implement the relevant models and use the programs themselves The book begins with a brief introduction to basic sampling theory and the fundamentals of simulation techniques followed by a comparison between R and Python It then discusses statistical diagnosis for financial security data and introduces some common tools in financial forensics such as Benford s Law Zipf s Law and anomaly detection The statistical estimation and Expectation Maximization EM Majorization Minimization MM algorithms are also covered The book next focuses on univariate and multivariate dynamic volatility and correlation forecasting and emphasis is placed on the celebrated Kelly s formula followed by a brief introduction to quantitative risk management and dependence modelling for extremal events A practical topic on numerical finance for traditional option pricing and Greek computations immediately follows as well as other important topics in financial data driven aspects such as Principal Component Analysis PCA and recommender systems with their applications as well as advanced regression learners such as kernel regression and logistic regression with discussions on model assessment methods such as simple Receiver Operating Characteristic ROC curves and Area Under Curve AUC for typical classification problems The book then moves on to other commonly used machine learning tools like linear classifiers such as perceptrons and their generalization the multilayered counterpart MLP Support Vector Machines SVM as well as Classification and Regression Trees CART and Random Forests Subsequent chapters focus on linear Bayesian learning including well received credibility theory in actuarial science and functional kernel regression and non linear Bayesian learning such as the Na ve Bayes classifier and the Comonotone Independence Bayesian Classifier CIBer recently independently developed by the authors and used successfully in InsurTech After an in depth discussion on cluster analyses such as K means clustering and its inversion the K nearest neighbor KNN method the book concludes by introducing some useful deep neural networks for FinTech like the potential use of the Long Short Term Memory model LSTM for stock price prediction This book can help readers become well equipped with the following skills To evaluate financial and insurance data quality and use the distilled knowledge obtained from the data after applying data analytic tools to make timely financial decisions To apply effective data dimension reduction tools to enhance supervised learning To describe and select suitable data analytic tools as introduced

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provide a better broader and more elaborate exposure of the subject New to this edition numerous application examples and exercises of stochastic processes in engineering systems and management detailed and current material on Markov chains Martingales renewal theory queueing and reliability more information on the latest research including the regenerative stochastic inventory system an up to date extensive bibliography and references at each chapter s end

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