



Random Interactive Models

Marie Duflo



Random Interactive Models:

Random Iterative Models Marie Duflo, 1997 An up to date self contained review of a wide range of recursive methods for stabilization identification and control of complex stochastic models guiding a rocket or a plane organizing multi access broadcast channels self learning of neural networks Suitable for mathematicians researchers and also students and engineers Random Iterative Models Marie Duflo, 2014-01-15 **Wave Propagation and Time Reversal in Randomly**

Layered Media Jean-Pierre Fouque, Josselin Garnier, G. Papanicolaou, Knut Solna, 2007-06-30 Our motivation for writing this book is twofold First the theory of waves propagating in randomly layered media has been studied extensively during the last thirty years but the results are scattered in many different papers This theory is now in a mature state especially in the very interesting regime of separation of scales as introduced by G Papanicolaou and his coauthors and described in 8 which is a building block for this book Second we were motivated by the time reversal experiments of M Fink and his group in Paris They were done with ultrasonic waves and have attracted considerable attention because of the surprising effects of enhanced spatial focusing and time compression in random media An exposition of this work and its applications is presented in 56 Time reversal experiments were also carried out with sonar arrays in shallow water by W Kuperman 113 and his group in San Diego The enhanced spatial focusing and time compression of signals in time reversal in random media have many diverse applications in detection and in focused energy delivery on small targets as for example in the destruction of kidney stones Enhanced spatial focusing is also useful in sonar and wireless communications for reducing interference Time reversal ideas have played an important role in the development of new methods for array imaging in random media as presented in 19

Spatial Statistics and Modeling Carlo Gaetan, Xavier Guyon, 2009-11-10 Spatial statistics are useful in subjects as diverse as climatology ecology economics environmental and earth sciences epidemiology image analysis and more This book covers the best known spatial models for three types of spatial data geostatistical data stationarity intrinsic models variograms spatial regression and space time models areal data Gibbs Markov fields and spatial auto regression and point pattern data Poisson Cox Gibbs and Markov point processes The level is relatively advanced and the presentation concise but complete The most important statistical methods and their asymptotic properties are described including estimation in geostatistics autocorrelation and second order statistics maximum likelihood methods approximate inference using the pseudo likelihood or Monte Carlo simulations statistics for point processes and Bayesian hierarchical models A chapter is devoted to Markov Chain Monte Carlo simulation Gibbs sampler Metropolis Hastings algorithms and exact simulation A large number of real examples are studied with R and each chapter ends with a set of theoretical and applied exercises While a foundation in probability and mathematical statistics is assumed three appendices introduce some necessary background The book is accessible to senior undergraduate students with a solid math background and Ph D students in statistics Furthermore experienced statisticians and researchers in the above mentioned fields will find the book valuable as a mathematically sound

reference This book is the English translation of *Modélisation et Statistique Spatiales* published by Springer in the series *Mathématiques Applications* a series established by Société de Mathématiques Appliquées et Industrielles SMAI

Elements of Queueing Theory Francois Baccelli, Pierre Bremaud, 2013-11-11 Queueing theory is a fascinating subject in Applied Probability for two contradictory reasons it sometimes requires the most sophisticated tools of stochastic processes and it often leads to simple and explicit answers More over its interest has been steadily growing since the pioneering work of Erlang in 1917 on the blocking of telephone calls to the more recent applications on the design of broadband communication networks and on the performance evaluation of computer architectures All this led to a huge literature articles and books at various levels of mathematical rigor Concerning the mathematical approach most of the explicit results have been obtained when specific assumptions Markov renewal are made The aim of the present book is in no way to give a systematic account of the formulas of queueing theory and their applications but rather to give a general framework in which these results are best understood and most easily derived What knowledge of this vast literature is needed to read the book As the title of the book suggests we believe that it can be read without prior knowledge of queueing theory at all although the unifying nature of the proposed framework will of course be more meaningful to readers who already studied the classical Markovian approach

Stochastic Simulation: Algorithms and Analysis Søren Asmussen, Peter W. Glynn, 2007-07-14 Sampling based computational methods have become a fundamental part of the numerical toolset of practitioners and researchers across an enormous number of different applied domains and academic disciplines This book provides a broad treatment of such sampling based methods as well as accompanying mathematical analysis of the convergence properties of the methods discussed The reach of the ideas is illustrated by discussing a wide range of applications and the models that have found wide usage Given the wide range of examples exercises and applications students practitioners and researchers in probability statistics operations research economics finance engineering as well as biology and chemistry and physics will find the book of value

Stochastic Simulation and Monte Carlo Methods Carl Graham, Denis Talay, 2013-07-16 In various scientific and industrial fields stochastic simulations are taking on a new importance This is due to the increasing power of computers and practitioners aim to simulate more and more complex systems and thus use random parameters as well as random noises to model the parametric uncertainties and the lack of knowledge on the physics of these systems The error analysis of these computations is a highly complex mathematical undertaking Approaching these issues the authors present stochastic numerical methods and prove accurate convergence rate estimates in terms of their numerical parameters number of simulations time discretization steps As a result the book is a self contained and rigorous study of the numerical methods within a theoretical framework After briefly reviewing the basics the authors first introduce fundamental notions in stochastic calculus and continuous time martingale theory then develop the analysis of pure jump Markov processes Poisson processes and stochastic differential equations In particular they review the essential properties of It integrals and prove

fundamental results on the probabilistic analysis of parabolic partial differential equations These results in turn provide the basis for developing stochastic numerical methods both from an algorithmic and theoretical point of view The book combines advanced mathematical tools theoretical analysis of stochastic numerical methods and practical issues at a high level so as to provide optimal results on the accuracy of Monte Carlo simulations of stochastic processes It is intended for master and Ph D students in the field of stochastic processes and their numerical applications as well as for physicists biologists economists and other professionals working with stochastic simulations who will benefit from the ability to reliably estimate and control the accuracy of their simulations

Nonlinear Time Series Randal Douc, Eric Moulines, David Stoffer, 2014-01-06 Designed for researchers and students Nonlinear Times Series Theory Methods and Applications with R Examples familiarizes readers with the principles behind nonlinear time series models without overwhelming them with difficult mathematical developments By focusing on basic principles and theory the authors give readers the background required to craft their own stochastic models numerical methods and software They will also be able to assess the advantages and disadvantages of different approaches and thus be able to choose the right methods for their purposes The first part can be seen as a crash course on classical time series with a special emphasis on linear state space models and detailed coverage of random coefficient autoregressions both ARCH and GARCH models The second part introduces Markov chains discussing stability the existence of a stationary distribution ergodicity limit theorems and statistical inference The book concludes with a self contained account on nonlinear state space and sequential Monte Carlo methods An elementary introduction to nonlinear state space modeling and sequential Monte Carlo this section touches on current topics from the theory of statistical inference to advanced computational methods The book can be used as a support to an advanced course on these methods or an introduction to this field before studying more specialized texts Several chapters highlight recent developments such as explicit rate of convergence of Markov chains and sequential Monte Carlo techniques And while the chapters are organized in a logical progression the three parts can be studied independently Statistics is not a spectator sport so the book contains more than 200 exercises to challenge readers These problems strengthen intellectual muscles strained by the introduction of new theory and go on to extend the theory in significant ways The book helps readers hone their skills in nonlinear time series analysis and their applications

Machine Learning and Knowledge Discovery in Databases Paolo Frasconi, Niels Landwehr, Giuseppe Manco, Jilles Vreeken, 2016-09-03 The three volume set LNAI 9851 LNAI 9852 and LNAI 9853 constitutes the refereed proceedings of the European Conference on Machine Learning and Knowledge Discovery in Databases ECML PKDD 2016 held in Riva del Garda Italy in September 2016 The 123 full papers and 16 short papers presented were carefully reviewed and selected from a total of 460 submissions The papers presented focus on practical and real world studies of machine learning knowledge discovery data mining innovative prototype implementations or mature systems that use machine learning techniques and knowledge discovery processes in a real setting recent advances at the frontier of machine

learning and data mining with other disciplines Part I and Part II of the proceedings contain the full papers of the contributions presented in the scientific track and abstracts of the scientific plenary talks Part III contains the full papers of the contributions presented in the industrial track short papers describing demonstration the nectar papers and the abstracts of the industrial plenary talks

Stochastic Integration and Differential Equations Philip Protter, 2013-12-21 It has been 15 years since the first edition of Stochastic Integration and Differential Equations A New Approach appeared and in those years many other texts on the same subject have been published often with connections to applications especially mathematical finance Yet in spite of the apparent simplicity of approach none of these books has used the functional analytic method of presenting semimartingales and stochastic integration Thus a 2nd edition seems worthwhile and timely though it is no longer appropriate to call it a new approach The new edition has several significant changes most prominently the addition of exercises for solution These are intended to supplement the text but lemmas needed in a proof are never relegated to the exercises Many of the exercises have been tested by graduate students at Purdue and Cornell Universities Chapter 3 has been completely redone with a new more intuitive and simultaneously elementary proof of the fundamental Doob Meyer decomposition theorem the more general version of the Girsanov theorem due to Lenglart the Kazamaki Novikov criteria for exponential local martingales to be martingales and a modern treatment of compensators Chapter 4 treats sigma martingales important in finance theory and gives a more comprehensive treatment of martingale representation including both the Jacod Yor theory and Emery's examples of martingales that actually have martingale representation thus going beyond the standard cases of Brownian motion and the compensated Poisson process New topics added include an introduction to the theory of the expansion of filtrations a treatment of the Fefferman martingale inequality and that the dual space of the martingale space H^1 can be identified with BMO martingales Solutions to selected exercises are available at the web site of the author with current URL <http://www.orie.cornell.edu/protter/books.html>

Monte Carlo Methods in Financial Engineering Paul Glasserman, 2013-03-09 Monte Carlo simulation has become an essential tool in the pricing of derivative securities and in risk management These applications have in turn stimulated research into new Monte Carlo methods and renewed interest in some older techniques This book develops the use of Monte Carlo methods in finance and it also uses simulation as a vehicle for presenting models and ideas from financial engineering It divides roughly into three parts The first part develops the fundamentals of Monte Carlo methods the foundations of derivatives pricing and the implementation of several of the most important models used in financial engineering The next part describes techniques for improving simulation accuracy and efficiency The final third of the book addresses special topics estimating price sensitivities valuing American options and measuring market risk and credit risk in financial portfolios The most important prerequisite is familiarity with the mathematical tools used to specify and analyze continuous time models in finance in particular the key ideas of stochastic calculus Prior exposure to the basic principles of option pricing is useful but not essential The book is

aimed at graduate students in financial engineering researchers in Monte Carlo simulation and practitioners implementing models in industry Mathematical Reviews 2004 this book is very comprehensive up to date and useful tool for those who are interested in implementing Monte Carlo methods in a financial context **Computer Aided Verification** Ruzica

Piskac,Zvonimir Rakamarić,2025-07-21 This open access 4 volume set constitutes the proceedings of the 37th International Conference on Computer Aided Verification CAV 2025 held in Zagreb Croatia in July 23 25 2025 The 51 regular papers presented together 24 tool papers 4 case study papers in these proceedings were carefully reviewed and selected from 305 submissions The accepted papers cover a wide spectrum of topics from theoretical results to applications of formal methods These papers apply or extend formal methods to a wide range of domains such as concurrency machine learning and neural networks quantum systems as well as hybrid and stochastic systems **Bayesian Methods** Jeff Gill,2007-11-26 The first

edition of Bayesian Methods A Social and Behavioral Sciences Approach helped pave the way for Bayesian approaches to become more prominent in social science methodology While the focus remains on practical modeling and basic theory as well as on intuitive explanations and derivations without skipping steps this second edition incorporates the latest methodology and recent changes in software offerings New to the Second Edition Two chapters on Markov chain Monte Carlo MCMC that cover ergodicity convergence mixing simulated annealing reversible jump MCMC and coupling Expanded coverage of Bayesian linear and hierarchical models More technical and philosophical details on prior distributions A dedicated R package BaM with data and code for the examples as well as a set of functions for practical purposes such as calculating highest posterior density HPD intervals Requiring only a basic working knowledge of linear algebra and calculus this text is one of the few to offer a graduate level introduction to Bayesian statistics for social scientists It first introduces Bayesian statistics and inference before moving on to assess model quality and fit Subsequent chapters examine hierarchical models within a Bayesian context and explore MCMC techniques and other numerical methods Concentrating on practical computing issues the author includes specific details for Bayesian model building and testing and uses the R and BUGS software for examples and exercises Theory and Approach of Information Retrievals from Electromagnetic Scattering and Remote Sensing Ya-Qiu Jin,2006-07-10 Advances in space borne remote sensing have significantly changed the mankind

viewpoint how to observe our own Earth planet Great amount of remote sensing data and images presents new resources to quantitatively describe and monitor our Earth environment atmosphere oceanic and land surfaces In remote sensing electromagnetic EM scattering emission and wave propagation as interaction with the Earth environment lay the physical basis for understanding and extracting geoscientific information Study of electromagnetic waves with remote sensing application has become an active and interdisciplinary area This book presents some new progress on the theoretical and numerical approaches for information retrieval of the remote sensing via EM scattering and emission We begin in Chapter 1 with the vector radiative transfer VRT theory for inhomogeneous scatter media The VRT takes account of multiple scattering

emission and propagation of random scatter media and quantitatively leads to insights of elucidating and understanding EM wave terrain surface interaction Meanwhile it is extensively applicable to carrying out data interpretation and validation and to solving the inverse problem e g iteratively physically or statistically In Chapter 1 iterative solutions of multiple scattering and emission from inhomogeneous dense scatter media and inhomogeneous non spherical scatter media are discussed Three dimensional VRT equation 3D VRT for spatially inhomogeneous random scatter media for high resolution observation is also investigated The polarimetric imagery of synthetic aperture radar SAR technology is one of most important advances in space borne microwave remote sensing during recent decades

Econophysics of Agent-Based Models Frédéric

Abergel,Hideaki Aoyama,Bikas K. Chakrabarti,Anirban Chakraborti,Asim Ghosh,2013-09-07 The primary goal of this book is to present the research findings and conclusions of physicists economists mathematicians and financial engineers working in the field of Econophysics who have undertaken agent based modelling comparison with empirical studies and related investigations Most standard economic models assume the existence of the representative agent who is perfectly rational and applies the utility maximization principle when taking action One reason for this is the desire to keep models mathematically tractable no tools are available to economists for solving non linear models of heterogeneous adaptive agents without explicit optimization In contrast multi agent models which originated from statistical physics considerations allow us to go beyond the prototype theories of traditional economics involving the representative agent This book is based on the Econophys Kolkata VII Workshop at which many such modelling efforts were presented In the book leading researchers in their fields report on their latest work consider recent developments and review the contemporary literature

Handbook of Discrete-Valued Time Series Richard A. Davis,Scott H. Holan,Robert Lund,Nalini Ravishanker,2016-01-06 Model a Wide Range of Count Time Series Handbook of Discrete Valued Time Series presents state of the art methods for modeling time series of counts and incorporates frequentist and Bayesian approaches for discrete valued spatio temporal data and multivariate data While the book focuses on time series of counts some of the techniques discussed ca

Numerical Probability Gilles Pagès,2018-07-31 This textbook provides a self contained introduction to numerical methods in probability with a focus on applications to finance Topics covered include the Monte Carlo simulation including simulation of random variables variance reduction quasi Monte Carlo simulation and more recent developments such as the multilevel paradigm stochastic optimization and approximation discretization schemes of stochastic differential equations as well as optimal quantization methods The author further presents detailed applications to numerical aspects of pricing and hedging of financial derivatives risk measures such as value at risk and conditional value at risk implicitation of parameters and calibration Aimed at graduate students and advanced undergraduate students this book contains useful examples and over 150 exercises making it suitable for self study

Foundations of Computational Mathematics Ronald A. DeVore,Arieh Iserles,Endre Süli,2001-05-17 Collection of papers by leading researchers in computational mathematics suitable for

graduate students and researchers **Fundamentals of Queueing Networks** Hong Chen, David D. Yao, 2013-04-17 The objective of this book is to collect in a single volume the essentials of stochastic networks from the classical product form theory to the more recent developments such as diffusion and fluid limits stochastic comparisons stability control dynamic scheduling and optimization The selection of materials inevitably is a reflection upon our bias and preference but it is also driven to a large extent by our desire to provide a graduate level text that is well balanced in breadth and depth suitable for the classroom Given the wide ranging applications of stochastic networks in recent years from supply chains to telecommunications it is also our hope that the book will serve as a useful reference for researchers and students alike in these diverse fields The book consists of three parts The first part Chapters 1 through 4 covers continuous time Markov chain models including the classical Jackson and Kelly networks the notion of quasi reversible queues and stochastic comparisons The second part Chapters 5 through 10 focuses on Brownian models including limit theorems for generalized Jackson networks and multiclass feedforward networks an in depth examination of stability in a Kumar Seidman network and Brownian approximations for general multiclass networks with a mixture of priority and first in first out disciplines The third part Chapters 11 and 12 discusses scheduling in both queueing stochastic and fluid deterministic networks along with topics such as conservation laws polymatroid optimization and linear programming Stochastic Processes Kaddour Najim, Enso Ikonen, Ait-Kadi Daoud, 2004-07-01 A stochastic process is a random or conjectural process and this book is concerned with applied probability and statistics Whilst maintaining the mathematical rigour this subject requires it addresses topics of interest to engineers such as problems in modelling control reliability maintenance data analysis and engineering involvement with insurance This book deals with the tools and techniques used in the stochastic process estimation optimisation and recursive logarithms in a form accessible to engineers and which can also be applied to Matlab Amongst the themes covered in the chapters are mathematical expectation arising from increasing information patterns the estimation of probability distribution the treatment of distribution of real random phenomena in engineering economics biology and medicine etc and expectation maximisation The latter part of the book considers optimization algorithms which can be used for example to help in the better utilization of resources and stochastic approximation algorithms which can provide prototype models in many practical applications An engineering approach to applied probabilities and statistics Presents examples related to practical engineering applications such as reliability randomness and use of resources Readers with varying interests and mathematical backgrounds will find this book accessible

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