Stochastic And Deterministic Averaging Processes

Deterministic and Stochastic Error Bounds in Numerical Analysis
Stochastic Dynamics. Modeling Solute Transport in Porous Media
Stochastic Methods and their Applications to Communications
Stochastic Numerical Methods
Stochastic Differential Equations
Controlled Stochastic Processes
Deterministic And Stochastic Topics In Computational Finance
Stable Non-Gaussian Self-Similar Processes with Stationary Increments
An Introduction to Stochastic Processes and Nonequilibrium Statistical Physics
Topics in Stochastic Analysis and Nonparametric Estimation
Product of Random Stochastic Matrices and Distributed Averaging
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Stochastic Models in Biology
Stochastic Differential Equations In Science And Engineering (With Cd-rom)
Nonlinear Random Vibration
Stochastic Analysis, Filtering, and Stochastic Optimization
Stochastic-Process Limits
Stochastic Processes, Finance and Control
Random Perturbations of Dynamical Systems
System Identification, Environmental Modelling, and Control System Design
Effective Dynamics of Stochastic Partial Differential Equations
Stochastic Systems
Assessment of Staffing Needs of Systems Specialists in Aviation
Seasonal Adjustment when Both Deterministic and Stochastic Seasonality are Present
Stochastic Processes in Mathematical Physics and Engineering
Statistical Inference for Piecewise-deterministic Markov Processes

Learning Automata
Fractional Deterministic and Stochastic Calculus

ASHLEY LILIA

Deterministic and Stochastic Error Bounds in Numerical Analysis Springer Science & Business Media
Stochastic Systems **Stochastic Dynamics. Modeling Solute Transport in Porous Media** Elsevier
From the reviews: "The material is self-contained, but it is technical and a solid foundation in probability and queuing theory is beneficial to prospective readers. [... It] is intended to be accessible to those with less background. This book is a must to researchers and graduate students interested in these areas." ISI Short Book Reviews
Stochastic Methods and their Applications to Communications Springer
Stochastic Methods & their Applications to Communications presents a valuable approach to the modelling, synthesis and numerical simulation of random processes with applications in communications and related fields. The authors provide a detailed account of random processes from an engineering point of view and illustrate the concepts with examples taken from the communications area. The discussions mainly focus on the analysis and synthesis of Markov models of random processes as applied to modelling such phenomena as interference and fading in communications. Encompassing both theory and practice, this original text provides a unified approach to the analysis and generation of continuous, impulsive and mixed random processes based on the Fokker-Planck equation for Markov processes. Presents the cumulated analysis of Markov processes Offers a SDE (Stochastic Differential Equations) approach to the generation of random processes with specified characteristics Includes the modelling of communication channels and interfer ences using SDE Features new results and techniques for the of solution of the generalized Fokker-Planck equation Essential reading for researchers, engineers, and graduate and upper year undergraduate students in the field of communications, signal processing, control, physics and other areas of science, this reference will have wide ranging appeal.
Stochastic Numerical Methods Springer Science & Business Media
Stochastic Numerical Methods introduces at Master level the numerical methods that use probability or stochastic concepts to analyze random processes. The book aims at being rather general and is addressed at students of natural sciences (Physics, Chemistry, Mathematics, Biology, etc.) and Engineering, but also social sciences (Economy, Sociology, etc.) where some of the techniques have been used recently to numerically simulate different agent-based models. Examples included in the book range from phase-transitions and critical phenomena, including details of data analysis (extraction of critical exponents, finite-size effects, etc.), to

population dynamics, interfacial growth, chemical reactions, etc. Program listings are integrated in the discussion of numerical algorithms to facilitate their understanding. From the contents: Review of Probability Concepts Monte Carlo Integration Generation of Uniform and Non-uniform Random Numbers: Non-correlated Values Dynamical Methods Applications to Statistical Mechanics Introduction to Stochastic Processes Numerical Simulation of Ordinary and Partial Stochastic Differential Equations Introduction to Master Equations Numerical Simulations of Master Equations Hybrid Monte Carlo Generation of n-Dimensional Correlated Gaussian Variables Collective Algorithms for Spin Systems Histogram Extrapolation Multicanonical Simulations

Stochastic Differential Equations John Wiley & Sons

The theory of controlled processes is one of the most recent mathematical theories to show very important applications in modern engineering, parti cularly for constructing automatic control systems, as well as for problems of economic control. However, actual systems subject to control do not admit a strictly deterministic analysis in view of random factors of various kinds which influence their behavior. Such factors include, for example, random noise occurring in the electrical system, variations in the supply and demand of commodities, fluctuations in the labor force in economics, and random failures of components on an automated line. The theory of con trolled processes takes the random nature of the behavior of a system into account. In such cases it is natural, when choosing a control strategy, to proceed from the average expected result, taking note of all the possible variants of the behavior of a controlled system. An extensive literature is devoted to various economic and engineering systems of control (some of these works are listed in the Bibliography). is no text which adequately covers the general However, as of now there mathematical theory of controlled processes. The authors ofthis monograph have attempted to fill this gap. In this volume the general theory of discrete-parameter (time) controlled processes (Chapter 1) and those with continuous-time (Chapter 2), as well as the theory of controlled stochastic differential equations (Chapter 3), are presented.

Controlled Stochastic Processes John Wiley & Sons

This book provides a self-contained presentation on the structure of a large class of stable processes, known as self-similar mixed moving averages. The authors present a way to describe and classify these processes by relating them to so-called deterministic flows. The first sections in the book review random variables, stochastic processes, and integrals, moving on to rigidity and flows, and finally ending with mixed moving averages and self-similarity. In-depth appendices are also included. This book is aimed at graduate students and researchers working in probability theory and statistics.

Deterministic And Stochastic Topics In Computational Finance Academic Press

This book introduces optimal control problems for large families of deterministic and stochastic systems with

discrete or continuous time parameter. These families include most of the systems studied in many disciplines, including Economics, Engineering, Operations Research, and Management Science, among many others. The main objective is to give a concise, systematic, and reasonably self contained presentation of some key topics in optimal control theory. To this end, most of the analyses are based on the dynamic programming (DP) technique. This technique is applicable to almost all control problems that appear in theory and applications. They include, for instance, finite and infinite horizon control problems in which the underlying dynamic system follows either a deterministic or stochastic difference or differential equation. In the infinite horizon case, it also uses DP to study undiscounted problems, such as the ergodic or long-run average cost. After a general introduction to control problems, the book covers the topic dividing into four parts with different dynamical systems: control of discrete-time deterministic systems, discrete-time stochastic systems, ordinary differential equations, and finally a general continuous-time MCP with applications for stochastic differential equations. The first and second part should be accessible to undergraduate students with some knowledge of elementary calculus, linear algebra, and some concepts from probability theory (random variables, expectations, and so forth). Whereas the third and fourth part would be appropriate for advanced undergraduates or graduate students who have a working knowledge of mathematical analysis (derivatives, integrals, ...) and stochastic processes.

Stable Non-Gaussian Self-Similar Processes with Stationary Increments National Academies Press

'Et moi, ..~ si lavait su CO.llUlJalt en revc:nir, One acMcc matbcmatica bu Jaldcred the human rac:c. It bu put COIDIDOD _ beet je n'y serais point aBe.' Jules Verne wbac it bdoup, 0Jl !be~ IbcII _t to !be dusty cauialcr Iabc&d 'diMardod__ The series is divergent; thc:reforc we may be -'. I!.ticT. Bc:I1 able to do something with it. O. Hcavisidc Mathematics is a tool for thought. A highly necessary tool in a world when: both feedback and non linearities abound. Similarly. all kinds of parts of mathematics serve as tools for other parts and for other sciences. Applying a simple rewriting rule to the quote on the right above one finds such statcmalts as: 'One service topology has rendered mathematical physics ...•; 'One service logic has rendered c0m puter science ...'; 'One service category theory has rendered mathematics ...'. All arguably true. And all statements obtainable this way form part of the raison d'etre of this series. This series, Mathematics and Its Applications. started in 19n. Now that over one hundred volumes have appeared it seems opportune to reexamine its scope. At the time I wrote "Growing specialization and diversification have brought a host of monographs and textbooks on increasingly specialized topics. However. the 'tree' of knowledge of mathematics and related fields does not grow only by putting forth new branc:hes. It also happens, quite often in fact, that branches which were thought to be

completely.

An Introduction to Stochastic Processes and Nonequilibrium Statistical Physics VSP

Within the Federal Aviation Administration (FAA), the Airway Transportation System Specialists ATSS) maintain and certify the equipment in the National Airspace System (NAS).In fiscal year 2012, Technical Operations had a budget of $1.7B. Thus, Technical Operations includes approximately 19 percent of the total FAA employees and less than 12 percent of the $15.9 billion total FAA budget. Technical Operations comprises ATSS workers at five different types of Air Traffic Control (ATC) facilities: (1) Air Route Traffic Control Centers, also known as En Route Centers, track aircraft once they travel beyond the terminal airspace and reach cruising altitude; they include Service Operations Centers that coordinate work and monitor equipment. (2) Terminal Radar Approach Control (TRACON) facilities control air traffic as aircraft ascend from and descend to airports, generally covering a radius of about 40 miles around the primary airport; a TRACON facility also includes a Service Operations Center. (3) Core Airports, also called Operational Evolution Partnership airports, are the nation's busiest airports. (4) The General National Airspace System (GNAS) includes the facilities located outside the larger airport locations, including rural airports and equipment not based at any airport. (5) Operations Control Centers are the facilities that coordinate maintenance work and monitor equipment for a Service Area in the United States. At each facility, the ATSS execute both tasks that are scheduled and predictable and tasks that are stochastic and unpredictable in. These tasks are common across the five ATSS disciplines: (1) Communications, maintaining the systems that allow air traffic controllers and pilots to be in contact throughout the flight; (2) Surveillance and Radar, maintaining the systems that allow air traffic controllers to see the specific locations of all the aircraft in the airspace they are monitoring; (3) Automation, maintaining the systems that allow air traffic controllers to track each aircraft's current and future position, speed, and altitude; (4) Navigation, maintaining the systems that allow pilots to take off, maintain their course, approach, and land their aircraft; and (5) Environmental, maintaining the power, lighting, and heating/air conditioning systems at the ATC facilities. Because the NAS needs to be available and reliable all the time, each of the different equipment systems includes redundancy so an outage can be fixed without disrupting the NAS. Assessment of Staffing Needs of Systems Specialists in Aviation reviews the available information on: (A) the duties of employees in job series 2101 (Airways Transportation Systems Specialist) in the Technical Operations service unit; (B) the Professional Aviation Safety Specialists (PASS) union of the AFL-CIO; (C) the present-day staffing models employed by the FAA; (D) any materials already produced by the FAA including a recent gap analysis on staffing requirements; (E) current research on best staffing models for safety; and (F) non-US staffing standards for employees in similar roles.

Topics in Stochastic Analysis and

Nonparametric Estimation World Scientific Publishing Company
Piecewise-deterministic Markov processes form a class of stochastic models with a sizeable scope of applications: biology, insurance, neuroscience, networks, finance... Such processes are defined by a deterministic motion punctuated by random jumps at random times, and offer simple yet challenging models to study. Nevertheless, the issue of statistical estimation of the parameters ruling the jump mechanism is far from trivial. Responding to new developments in the field as well as to current research interests and needs, Statistical inference for piecewise-deterministic Markov processes offers a detailed and comprehensive survey of state-of-the-art results. It covers a wide range of general processes as well as applied models. The present book also dwells on statistics in the context of Markov chains, since piecewise-deterministic Markov processes are characterized by an embedded Markov chain corresponding to the position of the process right after the jumps.
Product of Random Stochastic Matrices and Distributed Averaging Springer
To honor Rafail Z. Khasminskii, on his seventy-fifth birthday, for his contributions to stochastic processes and nonparametric estimation theory an IMA participating institution conference entitled "Conference on Asymptotic Analysis in Stochastic Processes, Nonparametric Estimation, and Related Problems" was held. This volume commemorates this special event. Dedicated to Professor Khasminskii, it consists of nine papers on various topics in probability and statistics.
Applied Stochastic Processes Springer Science & Business Media
This Festschrift is dedicated to Robert J Elliott on the occasion of his 70th birthday It brings together a collection of chapters by distinguished and eminent scholars in the fields of stochastic processes, filtering and control, as well as their applications to mathematical finance It presents cutting edge developments in these fields and is a valuable source of references for researchers, graduate students and market practitioners in mathematical finance and financial engineering Topics include the theory of stochastic processes, differential and stochastic games, mathematical finance, filtering and control.
An Introduction to Optimal Control Theory World Scientific
This book aims to provide a compact and unified introduction to the most important aspects in the physics of non-equilibrium systems. It first introduces stochastic processes and some modern tools and concepts that have proved their usefulness to deal with non-equilibrium systems from a purely probabilistic angle. The aim is to show the important role played by fluctuations in far-from-equilibrium situations, where noise can promote order and organization, switching among non-equilibrium states, etc. The second part adopts a more historical perspective, retracing the first steps taken from the purely thermodynamic as well as from the kinetic points of view to depart (albeit slightly) from equilibrium. The third part revisits the path outlined in the first one, but now undertakes the mesoscopic description of

extended systems, where new phenomena (patterns, long-range correlations, scaling far from equilibrium, etc.) are observed. This book is a revised and extended version of an earlier edition published in 1994. It includes topics of current research interest in far-from-equilibrium situations like noise-induced phenomena and free energy-like functionals, surface growth and roughening, etc. It can be used as an advanced textbook by graduate students in physics. It also covers topics of current interest in other disciplines and interdisciplinary approaches in engineering, biophysics, and economics, among others. The level of detail in the book is enough to capture the interest of the reader and facilitate the path to more learning by exploring the modern research literature provided. At the same time, the book is also complete enough to be self-contained for those readers who just need an overview of the subject.

Elements Of Stochastic Dynamics Springer Science & Business Media Many notions and results presented in the previous editions of this volume have since become quite popular in applications, and many of them have been “rediscovered” in applied papers. In the present 3rd edition small changes were made to the chapters in which long-time behavior of the perturbed system is determined by large deviations. Most of these changes concern terminology. In particular, it is explained that the notion of sub-limiting distribution for a given initial point and a time scale is identical to the idea of metastability, that the stochastic resonance is a manifestation of metastability, and that the theory of this effect is a part of the large deviation theory. The reader will also find new comments on the notion of quasi-potential that the authors introduced more than forty years ago, and new references to recent papers in which the proofs of some conjectures included in previous editions have been obtained. Apart from the above mentioned changes the main innovations in the 3rd edition concern the averaging principle. A new Section on deterministic perturbations of one-degree-of-freedom systems was added in Chapter 8. It is shown there that pure deterministic perturbations of an oscillator may lead to a stochastic, in a certain sense, long-time behavior of the system, if the corresponding Hamiltonian has saddle points. The usefulness of a joint consideration of classical theory of deterministic perturbations together with stochastic perturbations is illustrated in this section. Also a new Chapter 9 has been inserted in which deterministic and stochastic perturbations of systems with many degrees of freedom are considered. Because of the resonances, stochastic regularization in this case is even more important.

Continuous Average Control of Piecewise Deterministic Markov Processes Walter de Gruyter GmbH & Co KG The intent of this book is to present recent results in the control theory for the long run average continuous control problem of piecewise deterministic Markov processes (PDMPs). The book focuses mainly on the long run average cost criteria and extends to the PDMPs some well-known

techniques related to discrete-time and continuous-time Markov decision processes, including the so-called ``average inequality approach'', ``vanishing discount technique'' and ``policy iteration algorithm''. We believe that what is unique about our approach is that, by using the special features of the PDMPs, we trace a parallel with the general theory for discrete-time Markov Decision Processes rather than the continuous-time case. The two main reasons for doing that is to use the powerful tools developed in the discrete-time framework and to avoid working with the infinitesimal generator associated to a PDMP, which in most cases has its domain of definition difficult to be characterized. Although the book is mainly intended to be a theoretically oriented text, it also contains some motivational examples. The book is targeted primarily for advanced students and practitioners of control theory. The book will be a valuable source for experts in the field of Markov decision processes. Moreover, the book should be suitable for certain advanced courses or seminars. As background, one needs an acquaintance with the theory of Markov decision processes and some knowledge of stochastic processes and modern analysis.

Applied Stochastic Differential Equations

World Scientific Publishing Company

Effective Dynamics of Stochastic Partial Differential Equations focuses on stochastic partial differential equations with slow and fast time scales, or large and small spatial scales. The authors have developed basic techniques, such as averaging, slow manifolds, and homogenization, to extract effective dynamics from these stochastic partial differential equations. The authors' experience both as researchers and teachers enable them to convert current research on extracting effective dynamics of stochastic partial differential equations into concise and comprehensive chapters. The book helps readers by providing an accessible introduction to probability tools in Hilbert space and basics of stochastic partial differential equations. Each chapter also includes exercises and problems to enhance comprehension. New techniques for extracting effective dynamics of infinite dimensional dynamical systems under uncertainty Accessible introduction to probability tools in Hilbert space and basics of stochastic partial differential equations Solutions or hints to all Exercises

Stochastic Hybrid Systems

John Wiley & Sons

This book may be regarded as consisting of two parts. In Chapters I-IV we pre sent what we regard as essential topics in an introduction to deterministic optimal control theory. This material has been used by the authors for one semester graduate-level courses at Brown University and the University of Kentucky. The simplest problem in calculus of variations is taken as the point of departure, in Chapter I. Chapters II, III, and IV deal with necessary conditions for an opti mum, existence and regularity theorems for optimal controls, and the method of dynamic programming. The beginning reader may find it useful first to learn the main results, corollaries, and examples.

These tend to be found in the earlier parts of each chapter. We have deliberately postponed some difficult technical proofs to later parts of these chapters. In the second part of the book we give an introduction to stochastic optimal control for Markov diffusion processes. Our treatment follows the dynamic pro gramming method, and depends on the intimate relationship between second order partial differential equations of parabolic type and stochastic differential equations. This relationship is reviewed in Chapter V, which may be read inde pendently of Chapters I-IV. Chapter VI is based to a considerable extent on the authors' work in stochastic control since 1961. It also includes two other topics important for applications, namely, the solution to the stochastic linear regulator and the separation principle.

The Unity of Science and Economics Springer Science & Business Media

Sample-Path Analysis of Queueing Systems uses a deterministic (sample-path) approach to analyze stochastic systems, primarily queueing systems and more general input-output systems. Among other topics of interest it deals with establishing fundamental relations between asymptotic frequencies and averages, pathwise stability, and insensitivity. These results are utilized to establish useful performance measures. The intuitive deterministic approach of this book will give researchers, teachers, practitioners, and students better insights into many results in queueing theory. The simplicity and intuitive appeal of the arguments will make these results more accessible, with no sacrifice of mathematical rigor. Recent topics such as pathwise stability are also covered in this context. The book consistently takes the point of view of focusing on one sample path of a stochastic process. Hence, it is devoted to providing pure sample-path arguments. With this approach it is possible to separate the issue of the validity of a relationship from issues of existence of limits and/or construction of stationary framework. Generally, in many cases of interest in queueing theory, relations hold, assuming limits exist, and the proofs are elementary and intuitive. In other cases, proofs of the existence of limits will require the heavy machinery of stochastic processes. The authors feel that sample-path analysis can be best used to provide general results that are independent of stochastic assumptions, complemented by use of probabilistic arguments to carry out a more detailed analysis. This book focuses on the first part of the picture. It does however, provide numerous examples that invoke stochastic assumptions, which typically are presented at the ends of the chapters.

Sample-Path Analysis of Queueing Systems Springer

This book describes the mathematical underpinnings of algorithms used for molecular dynamics simulation, including both deterministic and stochastic numerical methods. Molecular dynamics is one of the most versatile and powerful methods of modern computational science and engineering and is used widely in chemistry, physics, materials science and biology. Understanding the foundations of numerical methods means knowing how to select the

best one for a given problem (from the wide range of techniques on offer) and how to create new, efficient methods to address particular challenges as they arise in complex applications. Aimed at a broad audience, this book presents the basic theory of Hamiltonian mechanics and stochastic differential equations, as well as topics including symplectic numerical methods, the handling of constraints and rigid bodies, the efficient treatment of Langevin dynamics, thermostats to control the molecular ensemble, multiple time-stepping, and the dissipative particle dynamics method.

Stochastic and Deterministic Averaging Processors Springer Science & Business Media

In these notes different deterministic and stochastic error bounds of numerical analysis are investigated. For many computational problems we have only partial information (such as n function values) and consequently they can only be solved with uncertainty in the answer. Optimal methods and optimal error bounds are sought if only the type of information is indicated. First, worst case error bounds and their relation to the theory of n-widths are considered; special problems such approximation, optimization, and integration for different function classes are studied and adaptive and nonadaptive methods are compared. Deterministic (worst case) error bounds are often unrealistic and should be complemented by different average error bounds. The error of Monte Carlo methods and the average error of deterministic methods are discussed as are the conceptual difficulties of different average errors. An appendix deals with the existence and uniqueness of optimal methods. This book is an introduction to the area and also a research monograph containing new results. It is addressd to a general mathematical audience as well as specialists in the areas of numerical analysis and approximation theory (especially optimal recovery and information-based complexity).