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Diffusion Processes and Partial Differential Equations
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Diffusion processes and their sample paths

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Diffusion Processes and Partial Differential Equations Springer
Stochastic processes are widely used for model building in the social, physical, engineering and life sciences as well as in financial economics. In model building, statistical inference for stochastic processes is of great importance from both a theoretical and an applications point of view. This book deals with Fractional Diffusion Processes and statistical inference for such stochastic processes. The main focus of the book is to consider parametric and nonparametric inference problems for fractional diffusion processes when a complete path of the process over a finite interval is observable. Key features: Introduces self-similar processes, fractional Brownian motion and stochastic integration with respect to fractional Brownian motion. Provides a comprehensive review of statistical inference for processes driven by fractional Brownian motion for modelling long range dependence. Presents a study of parametric and nonparametric inference problems for the fractional diffusion process. Discusses the fractional Brownian sheet and infinite dimensional fractional Brownian motion. Includes recent results and developments in the area of statistical inference of fractional diffusion processes. Researchers and students working on the statistics of fractional diffusion processes and applied mathematicians and statisticians involved in stochastic process modelling will benefit from this book.
Inference for Diffusion Processes Springer
This book presents various results and techniques from the

theory of stochastic processes that are useful in the study of stochastic problems in the natural sciences. The main focus is analytical methods, although numerical methods and statistical inference methodologies for studying diffusion processes are also presented. The goal is the development of techniques that are applicable to a wide variety of stochastic models that appear in physics, chemistry and other natural sciences. Applications such as stochastic resonance, Brownian motion in periodic potentials and Brownian motors are studied and the connection between diffusion processes and time-dependent statistical mechanics is elucidated. The book contains a large number of illustrations, examples, and exercises. It will be useful for graduate-level courses on stochastic processes for students in applied mathematics, physics and engineering. Many of the topics covered in this book (reversible diffusions, convergence to equilibrium for diffusion processes, inference methods for stochastic differential equations, derivation of the generalized Langevin equation, exit time problems) cannot be easily found in textbook form and will be useful to both researchers and students interested in the applications of stochastic processes.

Diffusions in Analysis and Geometry CRC Press

Asset returns have traditionally been modeled in the literature as following continuous-time Markov processes, and in many cases diffusions. Can discretely sampled financial rate data help us decide which continuous-time models are sensible? Diffusion processes are characterized by the continuity of their sample paths. This cannot be verified from the discrete sample path: by nature, even if the underlying sample path were continuous, the discretely sampled data will always appear as a sequence of discrete jumps. Instead, this paper relies on a characterization of the transition density of the discrete data to determine whether the discontinuities observed in the discrete data are the result of the discreteness of sampling, or rather evidence of genuine jump dynamics for the underlying continuous-time process. I then focus on the implications of this approach for option pricing models.

Diffusion Processes in Advanced Technological Materials World Scientific

Since its first publication in 1965 in the series Grundlehren der mathematischen Wissenschaften this book has had a profound and enduring influence on research into the stochastic processes associated with diffusion phenomena. Generations of mathematicians have appreciated the clarity of the descriptions given of one- or more- dimensional diffusion processes and the mathematical insight provided into Brownian motion. Now, with its republication in the Classics in Mathematics it is hoped that a new generation will be able to enjoy the classic text of Itô and McKean.

Asymptotic Methods in Stochastics American Mathematical Soc.

The first book in inference for stochastic processes from a statistical, rather than a probabilistic, perspective. It provides a systematic exposition of theoretical results from over ten years of mathematical literature and presents, for the first time in book form, many new techniques and approaches.

In Memoriam Marc Yor - Séminaire de Probabilités XLVII

Diffusion Processes and their Sample Paths

From the reviews: "This book is an excellent presentation of the

application of martingale theory to the theory of Markov processes, especially multidimensional diffusions. [...] This monograph can be recommended to graduate students and research workers but also to all interested in Markov processes from a more theoretical point of view." Mathematische Operationsforschung und Statistik

Diffusion Processes and Their Sample Paths Blackwell Publishing

Diffusion Processes and their Sample PathsSpringer Science & Business Media

Limit Theorems for Markov-modulated and Reflected Diffusion Processes Elsevier

The main goal of this Handbook is to survey measure theory with its many different branches and its relations with other areas of mathematics. Mostly aggregating many classical branches of measure theory the aim of the Handbook is also to cover new fields, approaches and applications which support the idea of "measure" in a wider sense, e.g. the ninth part of the Handbook. Although chapters are written of surveys in the various areas they contain many special topics and challenging problems valuable for experts and rich sources of inspiration. Mathematicians from other areas as well as physicists, computer scientists, engineers and econometrists will find useful results and powerful methods for their research. The reader may find in the Handbook many close relations to other mathematical areas: real analysis, probability theory, statistics, ergodic theory, functional analysis, potential theory, topology, set theory, geometry, differential equations, optimization, variational analysis, decision making and others. The Handbook is a rich source of relevant references to articles, books and lecture notes and it contains for the reader's convenience an extensive subject and author index.

Henry P. McKean Jr. Selecta Springer Science & Business Media

These notes are based on a one-quarter course given at the Department of Biophysics and Theoretical Biology of the University of Chicago in 1916. The course was directed to graduate students in the Division of Biological Sciences with interests in population biology and neurobiology. Only a slight acquaintance with probability and differential equations is required of the reader. Exercises are interwoven with the text to encourage the reader to play a more active role and thus facilitate his digestion of the material. One aim of these notes is to provide a heuristic approach, using as little mathematics as possible, to certain aspects of the theory of stochastic processes that are being increasingly employed in some of the population biol ogy and neurobiology literature. While the subject may be classical, the nov elty here lies in the approach and point of view, particularly in the applica tions such as the approach to the neuronal firing problem and its related dif fusion approximations. It is a pleasure to thank Professors Richard C. Lewontin and Arnold J.F. Siegert for their interest and support, and Mrs. Angell Pasley for her excellent and careful typing. I . PRELIMINARIES 1. Terminology and Examples Consider an experiment specified by: a) the experiment's outcomes, ~, forming the space S; b) certain subsets of S (called events) and by the probabilities of these events.

Diffusion Processes Springer

This Second Course continues the development of the theory and applications of stochastic processes as promised in the preface of

A First Course. We emphasize a careful treatment of basic structures in stochastic processes in symbiosis with the analysis of natural classes of stochastic processes arising from the biological, physical, and social sciences.

2nd Corr. Pr MIT Press

This volume is dedicated to the memory of Marc Yor, who passed away in 2014. The invited contributions by his collaborators and former students bear testament to the value and diversity of his work and of his research focus, which covered broad areas of probability theory. The volume also provides personal recollections about him, and an article on his essential role concerning the Doeblin documents. With contributions by P. Salminen, J-Y. Yen & M. Yor; J. Warren; T. Funaki; J. Pitman& W. Tang; J-F. Le Gall; L. Alili, P. Graczyk & T. Zak; K. Yano & Y. Yano; D. Bakry & O. Zribi; A. Aksamit, T. Choulli & M. Jeanblanc; J. Pitman; J. Obloj, P. Spoida & N. Touzi; P. Biane; J. Najnudel; P. Fitzsimmons, Y. Le Jan & J. Rosen; L.C.G. Rogers & M. Duembgen; E. Azmoodeh, G. Peccati & G. Poly, timP-L Méliot, A. Nikeghbali; P. Baldi; N. Demni, A. Rouault & M. Zani; N. O'Connell; N. Ikeda & H. Matsumoto; A. Comtet & Y. Tourigny; P. Bougerol; L. Chaumont; L. Devroye & G. Letac; D. Stroock and M. Emery.

Applied Diffusion Processes from Engineering to Finance World Scientific

Stochastic control theory is a relatively young branch of mathematics. The beginning of its intensive development falls in the late 1950s and early 1960s. ~urin~ that period an extensive literature appeared on optimal stochastic control using the quadratic performance criterion (see references in Wonham [76]). At the same time, Girsanov [25] and Howard [26] made the first steps in constructing a general theory, based on Bellman's technique of dynamic programming, developed by him somewhat earlier [4]. Two types of engineering problems engendered two different parts of stochastic control theory. Problems of the first type are associated with multistep decision making in discrete time, and are treated in the theory of discrete stochastic dynamic programming. For more on this theory, we note in addition to the work of Howard and Bellman, mentioned above, the books by Derman [8], Mine and Osaki [55], and Dynkin and Yushkevich [12]. Another class of engineering problems which encouraged the development of the theory of stochastic control involves time continuous control of a dynamic system in the presence of random noise. The case where the system is described by a differential equation and the noise is modeled as a time continuous random process is the core of the optimal control theory of diffusion processes. This book deals with this latter theory.

Diffusion Processes and Their Sample Paths John Wiley & Sons

V.1. A.N. v.2. O.Z. Apendices and indexes.

Stochastic Analysis and Diffusion Processes Elsevier

This topical volume on "Recent Developments of Diffusion Processes and their Applications: Fluid, Heat and Mass" addresses diffusion in a wider sense with a special focus on technical applications. Diffusion phenomena play an important role in the development of modern engineering materials and related fields. Understanding these different transport phenomena at many levels, from atomistic to macro, has therefore long attracted the attention of many researchers in materials science and engineering and related disciplines. The present topical volume

captures a representative cross-section of some of the recent advances in the area of diffusive transport. Reflecting the enormous breadth of the area, the range of topics covered is accordingly very large. Topics include classical mass diffusion problems such as phase transformations, corrosion behavior, thin layers and microstructures. Technical applications related to fuel production and energy conversion, biological and biomedical material are treated. Many of these topics are related to experimental measurements and methods as well as simulation and approaches to predict properties and processes.

Diffusion Processes and Related Problems in Analysis, Volume I Springer

In probability theory and statistics, a diffusion process is a solution to a stochastic differential equation. It is a continuous-time Markov process with almost surely continuous sample paths. Brownian motion, reflected Brownian motion and Ornstein-Uhlenbeck processes are examples of diffusion processes. A sample path of a diffusion process models the trajectory of a particle embedded in a flowing fluid and subjected to random displacements due to collisions with other particles, which is called Brownian motion. The position of the particle is then random; its probability density function as a function of space and time is governed by an advection-diffusion equation.

Encyclopedic Dictionary of Mathematics Birkhäuser

This book provides a careful and accessible exposition of functional analytic methods in stochastic analysis. It focuses on the relationship between Markov processes and elliptic boundary value problems and explores several recent developments in the theory of partial differential equations which have made further progress in the study of Markov processes possible. This book will have great appeal to both advanced students and researchers as an introduction to three interrelated subjects in analysis (Markov processes, semigroups, and elliptic boundary value problems), providing powerful methods for future research.

Birkhäuser

Diffusion processes are a promising instrument for realistically modelling the time-continuous evolution of phenomena not only in the natural sciences but also in finance and economics. Their mathematical theory, however, is challenging, and hence diffusion modelling is often carried out incorrectly, and the according statistical inference is considered almost exclusively by theoreticians. This book explains both topics in an illustrative way which also addresses practitioners. It provides a complete overview of the current state of research and presents important, novel insights. The theory is demonstrated using real data applications.

by Kiyosi Ito and Henry P. Mckean, jr Birkhäuser

Stochastic analysis on Riemannian manifolds without boundary has been well established. However, the analysis for reflecting diffusion processes and sub-elliptic diffusion processes is far from complete. This book contains recent advances in this direction along with new ideas and efficient arguments, which are crucial for further developments. Many results contained here (for example, the formula of the curvature using derivatives of the semigroup) are new among existing monographs even in the case without boundary. Contents:PreliminariesDiffusion Processes on Riemannian Manifolds without BoundaryReflecting Diffusion Processes on Manifolds with BoundaryStochastic Analysis on Path

Space over Manifolds with BoundarySubelliptic Diffusion Processes Readership: Graduate students, researchers and professionals in probability theory, differential geometry and partial differential equations. Keywords:Diffusion Pocess;Reflecting Diffusion Process;Neumann Semigroup;Curvature;Second Fundamental Form;ManifoldKey Features:First book where the key theory and machinery of the reflecting diffusion processes on Riemannian manifolds with boundary are systematically introducedFirst book to clarify intrinsic links between the semigroup properties on one hand and geometric quantities (curvature and second fundamental form) on the other, and these links are introduced in an easy to understand manner: by formulating geometric quantities using short time behaviors of derivatives of the semigroup, whereby a reader can easily comprehend the equivalence of semigroup properties associated with lower bounds of these geometric quantitiesFirst book where stochastic analysis on Riemannian manifolds with boundary are introduced

Selected Papers of Hiroshi Tanaka Springer Science & Business Media

This volume presents a selection of papers by Henry P. McKean, which illustrate the various areas in mathematics in which he has made seminal contributions. Topics covered include probability theory, integrable systems, geometry and financial mathematics. Each paper represents a contribution by Prof. McKean, either alone or together with other researchers, that has had a profound influence in the respective area.

Partial Differential Equations and Diffusion Processes Trans Tech Publications Ltd

Presents an important and unique introduction to random walk theory Random walk is a stochastic process that has proven to be a useful model in understanding discrete-state discrete-time processes across a wide spectrum of scientific disciplines. Elements of Random Walk and Diffusion Processes provides an interdisciplinary approach by including numerous practical examples and exercises with real-world applications in operations research, economics, engineering, and physics. Featuring an introduction to powerful and general techniques that are used in the application of physical and dynamic processes, the book presents the connections between diffusion equations and random motion. Standard methods and applications of Brownian motion are addressed in addition to Levy motion, which has become popular in random searches in a variety of fields. The book also covers fractional calculus and introduces percolation theory and its relationship to diffusion processes. With a strong emphasis on the relationship between random walk theory and diffusion processes, Elements of Random Walk and Diffusion Processes features: Basic concepts in probability, an overview of stochastic and fractional processes, and elements of graph theory Numerous practical applications of random walk across various disciplines, including how to model stock prices and gambling, describe the statistical properties of genetic drift, and simplify the random movement of molecules in liquids and gases Examples of the real-world applicability of random walk such as node movement and node failure in wireless networking, the size of the Web in computer science, and polymers in physics Plentiful examples and exercises throughout that illustrate the solution of many practical problems Elements of Random Walk and Diffusion

Processes is an ideal reference for researchers and professionals involved in operations research, economics, engineering, mathematics, and physics. The book is also an excellent textbook for upper-undergraduate and graduate level courses in probability and stochastic processes, stochastic models, random motion and Brownian theory, random walk theory, and diffusion process techniques.

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