Stochastic Representations And A Geometric Parametrization

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CAMILA EVIE

Stochastic Geometry and Its Applications Springer Science & Business Media Topics include matrix-

geometric invariant vectors, buffer models, queues in a random environment and more. *Quantum Stochastic Processes and Noncommutative Geometry* Springer Science & Business Media Filtering is the science of nding the law of a process given a partial observation of it. The main objects we study here are di usion processes. These are naturally associated with second-order linear di erential operators which are semi-elliptic and so introduce a possibly degenerate Riemannian structure on the state space. In fact, much of what we discuss is simply about two such operators intertwined by a smooth map, the \projection from the state space to the observations space", and does not involve any stochastic analysis. From the point of view of stochastic processes, our purpose is to present and to study the underlying geometric structure which allows us to perform the ltering in a Markovian framework with the resulting conditional law being that of a Markov process which is time inhomogeneous in general. This geometry is determined by the symbol of the operator on the state space which projects to a symbol on the observation space. The projectible symbol induces a (possibly non-linear and partially de ned) connection which lifts the observation process to the state space and gives a decomposition of the operator on the state space and of the noise. As

is standard we can recover the classical ltering theory in which the observations are not usually Markovian by application of the Girsanov- Maruyama-Cameron-Martin Theorem. This structure we have is examined in relation to a number of geometrical topics.

Cycle Representations of Markov Processes World Scientific

This book grew out of the Random Transformations and Invariance in Stochastic Dynamics conference held in Verona from the 25th to the 28th of March 2019 in honour of Sergio Albeverio. It presents the new area of studies concerning invariance and symmetry properties of finite and infinite dimensional stochastic differential equations.This area constitutes a natural, much needed, extension of the theory of classical ordinary and partial differential equations, where the reduction theory based on symmetry and invariance of such classical equations has historically proved to be very important both for theoretical and numerical studies and has given rise to important applications. The purpose of the present book is to present the state of the art of the studies on stochastic systems from this point of view, present some of the underlying fundamental ideas and methods involved, and to outline the main lines for future developments. The main focus is on bridging the gap between deterministic and stochastic approaches,

with the goal of contributing to the elaboration of a unified theory that will have a great impact both from the theoretical point of view and the point of view of applications. The reader is a mathematician or a theoretical physicist. The main discipline is stochastic analysis with profound ideas coming from Mathematical Physics and Lie's Group Geometry. While the audience consists essentially of academicians, the reader can also be a practitioner with Ph.D., who is interested in efficient stochastic modelling.

Stochastic Geometry

Springer Science & Business Media

Over the last fifteen years fractal geometry has established itself as a substantial mathematical theory in its own right. The interplay between fractal geometry, analysis and stochastics has highly influenced recent developments in mathematical modeling of complicated structures. This process has been forced by problems in these areas related to applications in statistical physics, biomathematics and finance. This book is a collection of survey articles covering many of the most recent developments, like Schramm-Loewner evolution, fractal scaling limits, exceptional sets for percolation, and heat kernels on fractals. The authors were the keynote speakers at the conference "Fractal Geometry and Stochastics IV" at Greifswald in September 2008.

The Geometry of Filtering

Springer Science & Business Media
Stochastic geometry involves the study of random geometric structures, and blends geometric, probabilistic, and statistical methods to provide powerful techniques for modeling and analysis. Recent developments in computational statistical analysis, particularly Markov chain Monte Carlo, have enormously extended the range of feasible applications. Stochastic Geometry: Likelihood and Computation provides a coordinated collection of chapters on important aspects of the rapidly developing field of stochastic geometry, including: o a "crash-course" introduction to key stochastic geometry themes o considerations of geometric sampling bias issues o tesselations o shape o random sets o image analysis o spectacular advances in likelihood-based inference now available to stochastic geometry through the techniques of Markov chain Monte Carlo

Stochastic Models, Information Theory, and Lie Groups, Volume 1
Springer Nature
The reader can learn about current developments in stochastic geometry with mathematical rigor on one hand, and find applications to real microstructure analysis in natural and material sciences on the other hand." "Audience: This volume is suitable for scientists in mathematics, statistics, natural sciences, physics, engineering (materials),

microscopy and image analysis, as well as postgraduate students in probability and statistics."--Jacket.

Fractal Geometry and Stochastics IV Springer Science & Business Media

Stochastic Geometry is the mathematical discipline which studies mathematical models for random geometric structures. This book collects lectures presented at the CIME summer school in Martina Franca in September 2004. The main lecturers covered Spatial Statistics, Random Points, Integral Geometry and Random Sets. These are complemented by two additional contributions on Random Mosaics and Crystallization Processes. The book presents a comprehensive and up-to-date description of important aspects of Stochastic Geometry.

Geometry and Invariance in Stochastic Dynamics American Mathematical Soc.

Collecting together contributed lectures and mini-courses, this book details the research presented in a special semester titled “Geometric mechanics – variational and stochastic methods” run in the first half of 2015 at the Centre Interfacultaire Bernoulli (CIB) of the Ecole Polytechnique Fédérale de Lausanne. The aim of the semester was to develop a common language needed to handle the wide variety of problems and phenomena occurring in stochastic geometric mechanics. It gathered mathematicians and scientists from several

different areas of mathematics (from analysis, probability, numerical analysis and statistics, to algebra, geometry, topology, representation theory, and dynamical systems theory) and also areas of mathematical physics, control theory, robotics, and the life sciences, with the aim of developing the new research area in a concentrated joint effort, both from the theoretical and applied points of view. The lectures were given by leading specialists in different areas of mathematics and its applications, building bridges among the various communities involved and working jointly on developing the envisaged new interdisciplinary subject of stochastic geometric mechanics.

Stochastic Geometry

Springer Science & Business Media

The classical theory of stochastic processes has important applications arising from the need to describe irreversible evolutions in classical mechanics; analogously quantum stochastic processes can be used to model the dynamics of irreversible quantum systems. Noncommutative, i.e. quantum, geometry provides a framework in which quantum stochastic structures can be explored. This book is the first to describe how these two mathematical constructions are related. In particular, key ideas of semigroups and complete positivity are combined to yield quantum dynamical semigroups (QDS). Sinha and Goswami also

develop a general theory of Evans-Hudson dilation for both bounded and unbounded coefficients. The unique features of the book, including the interaction of QDS and quantum stochastic calculus with noncommutative geometry and a thorough discussion of this calculus with unbounded coefficients, will make it of interest to graduate students and researchers in functional analysis, probability and mathematical physics.

Computer Performance Engineering Springer Stochastic geometry deals with models for random geometric structures. Its early beginnings are found in playful geometric probability questions, and it has vigorously developed during recent decades, when an increasing number of real-world applications in various sciences required solid mathematical foundations. Integral geometry studies geometric mean values with respect to invariant measures and is, therefore, the appropriate tool for the investigation of random geometric structures that exhibit invariance under translations or motions. Stochastic and Integral Geometry provides the mathematically oriented reader with a rigorous and detailed introduction to the basic stationary models used in stochastic geometry – random sets, point processes, random mosaics – and to the integral geometry that is needed for their investigation. The interplay between both disciplines is

demonstrated by various fundamental results. A chapter on selected problems about geometric probabilities and an outlook to non-stationary models are included, and much additional information is given in the section notes.
Stochastic Analysis for Poisson Point Processes Elsevier
Stochastic Geometry is the mathematical discipline which studies mathematical models for random geometric structures, as they appear frequently in almost all natural sciences or technical fields. Although its roots can be traced back to the 18th century (the Buffon needle problem), the modern theory of random sets was founded by D. Kendall and G. Matheron in the early 1970's. Its rapid development was influenced by applications in Spatial Statistics and by its close connections to Integral Geometry. The volume "Stochastic Geometry" contains the lectures given at the CIME summer school in Martina Franca in September 1974. The four main lecturers covered the areas of Spatial Statistics, Random Points, Integral Geometry and Random Sets, they are complemented by two additional contributions on Random Mosaics and Crystallization Processes. The book presents an up-to-date description of important parts of Stochastic Geometry.
New Trends in Stochastic Analysis and Related Topics American Mathematical Soc.
This book develops the stochastic geometry

framework for image analysis purpose. Two main frameworks are described: marked point process and random closed sets models. We derive the main issues for defining an appropriate model. The algorithms for sampling and optimizing the models as well as for estimating parameters are reviewed. Numerous applications, covering remote sensing images, biological and medical imaging, are detailed. This book provides all the necessary tools for developing an image analysis application based on modern stochastic modeling.

Stochastic and Integral Geometry Springer

This book constitutes the refereed proceedings of the 16th European Workshop on Computer Performance Engineering, EPEW 2019, held in Milan, Italy, in November 2019. The 10 papers presented in this volume together with one invited talk were carefully reviewed and selected from 13 submissions. The papers presented at the workshop reflect the diversity of modern performance engineering, with topics ranging from modeling and analysis of network/control protocols and high performance/BigData information systems, analysis of scheduling, blockchain technology, analytical modeling and simulation of computer/network systems.

Linear Stochastic Systems Springer Nature

The exposition is mathematically precise and takes into account the latest results.

However, in many cases proofs are omitted. Applied scientists who may not wish to follow the mathematical arguments in detail will still be able to interpret and use the formulae.

Stochastic Numerics for Mathematical Physics

Springer

This book presents a treatise on the theory and modeling of second-order stationary processes, including an exposition on selected application areas that are important in the engineering and applied sciences. The foundational issues regarding stationary processes dealt with in the beginning of the book have a long history, starting in the 1940s with the work of Kolmogorov, Wiener, Cramér and his students, in particular Wold, and have since been refined and complemented by many others. Problems concerning the filtering and modeling of stationary random signals and systems have also been addressed and studied, fostered by the advent of modern digital computers, since the fundamental work of R.E. Kalman in the early 1960s. The book offers a unified and logically consistent view of the subject based on simple ideas from Hilbert space geometry and coordinate-free thinking. In this framework, the concepts of stochastic state space and state space modeling, based on the notion of the conditional independence of past and future flows of the relevant signals, are revealed to be fundamentally unifying ideas. The book, based on

over 30 years of original research, represents a valuable contribution that will inform the fields of stochastic modeling, estimation, system identification, and time series analysis for decades to come. It also provides the mathematical tools needed to grasp and analyze the structures of algorithms in stochastic systems theory.

Stochastic Processes, Physics And Geometry Springer

Based on a conference held in honor of Professor Tarow Indow, this volume is organized into three major topics concerning the use of geometry in perception: * space -- referring to attempts to represent the subjective space within which we locate ourselves and perceive objects to reside; * color -- dealing with attempts to represent the structure of color percepts as revealed by various experimental procedures; and * scaling -- focusing on the organization of various bodies of data -- in this case perceptual -- through scaling techniques, primarily multidimensional ones. These topics provide a natural organization of the work in the field, as well as one that corresponds to the major aspects of Indow's contributions. This book's goal is to provide the reader with an overview of the issues in each of the areas, and to present current results from the laboratories of leading researchers in these areas.

Stochastic Geometry John Wiley & Sons

This volume and "IStochastic Processes,

Physics and Geometry: New Interplays II" present state-of-the-art research currently unfolding at the interface between mathematics and physics. Included are select articles from the international conference held in Leipzig (Germany) in honor of Sergio Albeverio's sixtieth birthday. The theme of the conference, "Infinite Dimensional (Stochastic) Analysis and Quantum Physics", was chosen to reflect Albeverio's wide-ranging scientific interests. The articles in these books reflect that broad range of interests and provide a detailed overview highlighting the deep interplay among stochastic processes, mathematical physics, and geometry. The contributions are written by internationally recognized experts in the fields of stochastic analysis, linear and nonlinear (deterministic and stochastic) PDEs, infinite dimensional analysis, functional analysis, commutative and noncommutative probability theory, integrable systems, quantum and statistical mechanics, geometric quantization, and neural networks. Also included are applications in biology and other areas. Most of the contributions are high-level research papers. However, there are also some overviews on topics of general interest. The articles selected for publication in these volumes were specifically chosen to introduce readers to advanced topics, to emphasize interdisciplinary connections, and to stress

future research directions. Volume I contains contributions from invited speakers; Volume II contains additional contributed papers. Members of the Canadian Mathematical Society may order at the AMS member price.

Matrix-geometric Solutions in Stochastic Models Cambridge University Press

This volume offers a unique and accessible overview of the most active fields in Stochastic Geometry, up to the frontiers of recent research. Since 2014, the yearly meeting of the French research structure GDR GeoSto has been preceded by two introductory courses. This book contains five of these introductory lectures. The first chapter is a historically motivated introduction to Stochastic Geometry which relates four classical problems (the Buffon needle problem, the Bertrand paradox, the Sylvester four-point problem and the bicycle wheel problem) to current topics. The remaining chapters give an application motivated introduction to contemporary Stochastic Geometry, each one devoted to a particular branch of the subject: understanding spatial point patterns through intensity and conditional intensities; stochastic methods for image analysis; random fields and scale invariance; and the theory of Gibbs point processes. Exposing readers to a rich theory, this book will encourage further exploration of the subject and its wide

applications. .

Stochastic Geometry, Spatial Statistics and Random Fields Springer This book is a substantially revised and expanded edition reflecting major developments in stochastic numerics since the first edition was published in 2004. The new topics, in particular, include mean-square and weak approximations in the case of nonglobally Lipschitz coefficients of Stochastic Differential Equations (SDEs) including the concept of rejecting trajectories; conditional probabilistic representations and their application to practical variance reduction using regression methods; multi-level Monte Carlo method; computing ergodic limits and additional classes of geometric integrators used in molecular dynamics; numerical methods for FBSDEs; approximation of parabolic SPDEs and nonlinear filtering problem based on the method of characteristics. SDEs have many applications in the natural sciences and in finance. Besides, the employment of probabilistic representations together with the Monte Carlo technique allows us to reduce the solution of multi-dimensional problems for partial differential equations to the integration of stochastic equations. This approach leads to powerful computational mathematics that is presented in the treatise. Many special schemes for SDEs are presented. In the second part of the

book numerical methods for solving complicated problems for partial differential equations occurring in practical applications, both linear and nonlinear, are constructed. All the methods are presented with proofs and hence founded on rigorous reasoning, thus giving the book textbook potential. An overwhelming majority of the methods are accompanied by the corresponding numerical algorithms which are ready for implementation in practice. The book addresses researchers and graduate students in numerical analysis, applied probability, physics, chemistry, and engineering as well as mathematical biology and financial mathematics.

Geometric Representations of Perceptual Phenomena

Springer Science & Business Media

This book collects selected contributions presented at the INdAM Workshop "Geometric Challenges in Isogeometric Analysis", held in Rome, Italy on January 27-31, 2020. It gives an overview of the forefront research on splines and their efficient use in isogeometric methods for the discretization of differential problems over complex and trimmed geometries. A variety of research topics in this context are covered, including (i) high-quality spline surfaces on complex and trimmed geometries, (ii) construction and analysis of smooth spline spaces on unstructured meshes, (iii) numerical aspects and

benchmarking of isogeometric discretizations on unstructured meshes, meshing strategies and software. Given its scope, the book will be of interest to both researchers and graduate students working in the areas of approximation theory, geometric design and numerical simulation.