Lyapunov Exponents Of Products Of Random Matrices

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Introduction to Smooth Ergodic Theory Springer
Famous mathematical constants include the ratio of circular circumference to diameter, π = 3.14 ..., and the natural logarithm base, e = 2.718 .... Students and professionals can often name a few others, but there are many more buried in the literature and awaiting discovery. How do such constants arise, and why are they important? Here the author renews the search he began in his book Mathematical Constants, adding another 133 essays that broaden the landscape. Topics include the minimality of soap film surfaces, prime numbers, elliptic curves and modular forms, Poisson–Voronoi tessellations, random triangles, Brownian motion, uncertainty inequalities, Prandtl–Blasius flow (from fluid dynamics), Lyapunov exponents, knots and tangles, continued fractions, Galton–Watson trees, electrical capacitance (from potential theory), Zermelo's navigation problem, and the optimal control of a pendulum. Unsolved problems appear virtually everywhere as well. This volume continues an outstanding scholarly attempt to bring together all significant mathematical constants in one place.
Lectures on Lyapunov Exponents Birkhäuser
This self-contained monograph presents a unified exposition of the thermodynamic formalism and some of its main extensions, with emphasis on the relation to dimension theory and multifractal analysis of dynamical systems. In particular, the book considers three different flavors of the thermodynamic formalism, namely nonadditive, subadditive, and almost additive, and provides a detailed discussion of some of the most significant results in the area, some of them quite recent. It also includes a discussion of the most substantial applications of these flavors of the thermodynamic formalism to dimension theory and multifractal analysis of dynamical systems.
Particle-Laden Flow Springer Science & Business Media
The theory of Lyapunov exponents originated over a century ago in the study of the stability of solutions of differential equations. Written by one of the subject's leading authorities, this book is both an account of the classical theory, from a modern view, and an introduction to the significant developments relating the subject to dynamical systems, ergodic theory, mathematical physics and probability. It is based on the author's own graduate course and is reasonably self-contained with an extensive set of exercises provided at the end of each chapter. This book makes a welcome addition to the literature, serving as a graduate text and a valuable reference for researchers in the field.
Including Applications to the Life Sciences Springer Science & Business Media
The aim of this monograph is to present a general method of proving continuity of Lyapunov exponents of linear cocycles. The method uses an inductive procedure based on a general, geometric version of the Avalanche Principle. The main assumption required by this method is the availability of appropriate large deviation type estimates for quantities related to the iterates of the base and fiber dynamics associated with the linear cocycle. We establish such estimates for various models of random and quasi-periodic cocycles. Our method has its origins in a paper of M. Goldstein and W. Schlag. Our present work expands upon their approach in both depth and breadth. We conclude this monograph with a list of related open problems, some of which may be treated using a similar approach.
Lyapunov Exponents Cambridge University Press
The first systematic presentation of the theory of dynamical systems under the influence of randomness, this book includes products of random mappings as well as random and stochastic differential equations. The basic multiplicative ergodic theorem is presented, providing a random substitute for linear algebra. On its basis, many applications are detailed. Numerous instructive examples are treated analytically or numerically.
Proceedings of a Workshop Held in Bremen, November 12-15, 1984 Springer
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14th International Conference, RP 2020, Paris, France, October 19–21, 2020, Proceedings World Scientific
A self-contained, comprehensive account of modern smooth ergodic theory, the mathematical foundation of deterministic chaos.
Partially Hyperbolic Dynamics, Laminations, and Teichmuller Flow Springer Science & Business Media
"These are the proceedings of Localisation 2011, which took place at POSTECH in Pohang, South Korea, on August 4 to 7th 2011, as a satellite meeting of the 26th International Conference on Low Temperature Physics (LT26)."--
Advanced Technologies for Intelligent Systems of National Border Security John Wiley & Sons
The aim of this monograph is to present a general method of proving continuity of Lyapunov exponents of linear cocycles. The method uses an inductive procedure based on a general, geometric version of the Avalanche Principle. The main assumption required by this method is the availability of appropriate large deviation type estimates for quantities related to the iterates of the base and fiber dynamics associated with the linear cocycle. We establish such estimates for various models of random and quasi-periodic cocycles. Our method has its origins in a paper of M. Goldstein and W. Schlag. Our present work expands upon their approach in both depth and breadth. We conclude this monograph with a list of related open problems, some of which may be treated using a similar approach.
Lyapunov Exponents Springer Science & Business Media
In this thesis the Lyapunov exponents of random dynamical systems are presented and investigated. The main results are: 1. In the space of all unbounded linear cocycles satisfying a certain integrability condition, we construct an open set of linear cocycles have simple Lyapunov spectrum and no exponential separation. Thus, unlike the bounded case, the exponential separation property is nongeneric in the space of unbounded cocycles. 2. The multiplicative ergodic theorem is established for random difference equations as well as random differential equations with random delay. 3. We provide a computational method for computing an invariant measure for infinite iterated functions systems as well as the Lyapunov exponents of products of random matrices.
Handbook of Dynamical Systems Princeton University Press
Lyapunov exponents lie at the heart of chaos theory, and are widely used in studies of complex dynamics. Utilising a pragmatic, physical approach, this self-contained book provides a comprehensive description of the concept. Beginning with the basic properties and numerical methods, it then guides readers through to the most recent advances in applications to complex systems. Practical algorithms are thoroughly reviewed and their performance is discussed, while a broad set of examples illustrate the wide range of potential applications. The description of various numerical and analytical techniques for the computation of Lyapunov exponents offers an extensive array of tools for the characterization of phenomena such as synchronization, weak and global chaos in low and high-dimensional set-ups, and localization. This text equips readers with all the

investigative expertise needed to fully explore the dynamical properties of complex systems, making it ideal for both graduate students and experienced researchers.
Localisation 2011 World Scientific
Products of Random Matrices and Lyapunov ExponentsLyapunov ExponentsA Tool to Explore Complex DynamicsCambridge University Press
Lyapunov Exponents for Random Dynamical Systems Atlantis Press
This book offers a self-contained introduction to the theory of Lyapunov exponents and its applications, mainly in connection with hyperbolicity, ergodic theory and multifractal analysis. It discusses the foundations and some of the main results and main techniques in the area, while also highlighting selected topics of current research interest. With the exception of a few basic results from ergodic theory and the thermodynamic formalism, all the results presented include detailed proofs. The book is intended for all researchers and graduate students specializing in dynamical systems who are looking for a comprehensive overview of the foundations of the theory and a sample of its applications.
Max-Plus Linear Stochastic Systems and Perturbation Analysis Springer
Onishchik, A. A. Kirillov, and E. B. Vinberg, who obtained their first results on Lie groups in Dynkin's seminar. At a later stage, the work of the seminar was greatly enriched by the active participation of 1. 1. Pyatetskii Shapiro. As already noted, Dynkin started to work in probability as far back as his undergraduate studies. In fact, his first published paper deals with a problem arising in Markov chain theory. The most significant among his earliest probabilistic results concern sufficient statistics. In [15] and [17], Dynkin described all families of one-dimensional probability distributions admitting non-trivial sufficient statistics. These papers have considerably influenced the subsequent research in this field. But Dynkin's most famous results in probability concern the theory of Markov processes. Following Kolmogorov, Feller, Doob and Ito, Dynkin opened a new chapter in the theory of Markov processes. He created the fundamental concept of a Markov process as a family of measures corresponding to var ious initial times and states and he defined time homogeneous processes in terms of the shift operators ()t. In a joint paper with his student A.
Reachability Problems Cambridge University Press
At the present moment, after the success of the renormalization group in providing a conceptual framework for studying second-order phase tran sitions, we have a nearly satisfactory understanding of the statistical me chanics of classical systems with a non-random Hamiltonian. The situation is completely different if we consider the theory of systems with a random Hamiltonian or of chaotic dynamical systems. The two fields are connected; in fact, in the latter the effects of deterministic chaos can be modelled by an appropriate stochastic process. Although many interesting results have been obtained in recent years and much progress has been made, we still lack a satisfactory understanding of the extremely wide variety of phenomena which are present in these fields. The study of disordered or chaotic systems is the new frontier where new ideas and techniques are being developed. More interesting and deep results are expected to come in future years. The properties of random matrices and their products form a basic tool, whose importance cannot be underestimated. They playa role as important as Fourier transforms for differential equations. This book is extremely interesting as far as it presents a unified approach for the main results which have been obtained in the study of random ma trices. It will become a reference book for people working in the subject. The book is written by physicists, uses the language of physics and I am sure that many physicists will read it with great pleasure.
Lyapunov Exponents and Smooth Ergodic Theory World Scientific
This proceedings volume reflects the current interest in and future direction of probability theory and related theory of analysis and statistics. It contains 2 survey papers and 21 contributed papers.
Progress in Theory and Applications Springer Science & Business Media
This book is aimed at students in communications and signal processing who want to extend their skills in the energy area. It describes power systems and why these backgrounds are so useful to smart grid, wireless communications being very different to traditional wireline communications.
Products of Random Matrices with Applications to Schrödinger Operators ScholarlyEditions
What is Dynamics about? In broad terms, the goal of Dynamics is to describe the long term evolution of systems for which an "infinitesimal" evolution rule is known. Examples and applications arise from all branches of science and technology, like physics, chemistry, economics, ecology, communications, biology, computer science, or meteorology, to mention just a few. These systems have in common the fact that each possible state may be described by a finite (or infinite) number of observable quantities, like position, velocity, temperature, concentration, population density, and the like. Thus, m the space of states (phase space) is a subset M of an Euclidean space M . Usually, there are some constraints between these quantities: for instance, for ideal gases pressure times volume must be proportional to temperature. Then the space M is often a manifold, an n-dimensional surface for some n
SL(2,R)-Action on Moduli Spaces of Flat Surfaces John Wiley & Sons
"The authors consider several nontrivial examples of dynamical systems with nonzero Lyapunov exponents to illustrate some basic methods and ideas of the theory.".
Lyapunov Exponents Springer Science & Business Media
This book contains a selection of the papers that were presented at the EUROMECH colloquium on particle-laden flow held at the University of Twente in 2006. The multiscale nature of this challenging field motivated the calling of the colloquium and reflects the central importance that the dispersion of particles in a flow has in various geophysical and environmental problems. The spreading of aerosols and soot in the air, the growth and dispersion of plankton blooms in seas and oceans, or the transport of sediment in rivers, estuaries and coastal regions are striking examples.

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