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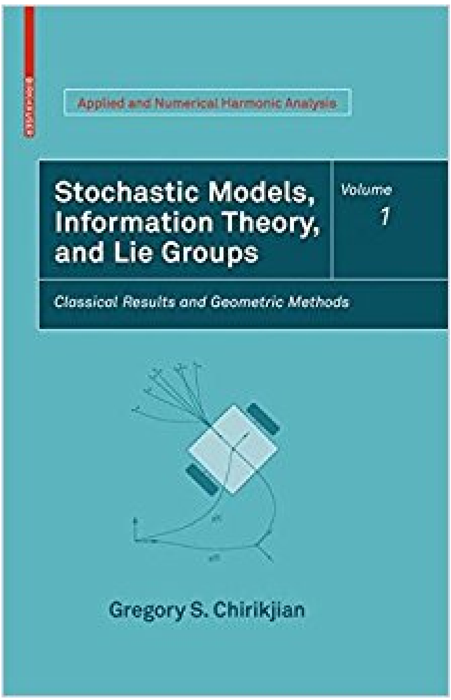
Stochastic Models, Information Theory, And Lie Groups, Volume 1: Classical Results And Geometric Methods (Applied And Numerical Harmonic Analysis)



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Synopsis

This unique two-volumeÂ set presentsÂ the subjects of stochastic processes, information theory, and Lie groupsÂ in a unified setting, thereby building bridges between fields that are rarely studied by the same people. Unlike the many excellent formal treatments available for each of these subjects individually, the emphasis in both of these volumes is on the use of stochastic, geometric, and group-theoretic concepts in the modeling of physical phenomena.Stochastic Models, Information Theory, and Lie Groups will be of interest to advanced undergraduate and graduate students, researchers, and practitionersÂ working in applied mathematics, the physical sciences, and engineering. Extensive exercises and motivating examples make the work suitable as a textbook for use in courses that emphasize applied stochastic processes or differential geometry.

Book Information

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Customer Reviews

The subjects of stochastic processes, information theory, and Lie groups are usually treated separately from each other. This unique two-volumeÂ set presents these topics in a unified setting, thereby building bridges between fields that are rarely studied by the same people. Unlike the many excellent formal treatments available for each of these subjects individually, the emphasis in both of these volumes is on the use of stochastic, geometric, and group-theoretic concepts in the modeling of physical phenomena.Volume 1 establishes the geometric and statistical foundations required to understand the fundamentals of continuous-time stochastic processes, differential geometry, and the probabilistic foundations of information theory. Volume 2 delves deeper into relationships between these topics, including stochastic geometry, geometric aspects of the theory of communications and coding, multivariate statistical analysis, and error propagation on Lie groups.Key features and topics ofÂ Volume 1:* The author reviews stochastic processes and basic differential geometry in an accessible way for applied mathematicians, scientists, and engineers.* Extensive exercises and motivating examples make the work suitable as a textbook for use in courses that emphasize applied stochastic processes or differential geometry.* The concept of Lie groups as continuous sets of symmetry operations is introduced.* The Fokkerâ “Planck Equation for diffusion processes in Euclidean space and on differentiable manifolds is derived in a way that can be understood by nonspecialists.* The concrete presentation style makes it easy for readers to obtain numerical solutions for their own problems; the emphasis is on how to calculate quantities rather than how to prove theorems.* A self-contained appendix provides a comprehensive review of concepts from linear algebra, multivariate calculus, and systems of ordinary differential equations.Stochastic Models, Information Theory, and Lie Groups will be of interest to advanced undergraduate and graduate students, researchers, and practitionersÂ working in applied mathematics, the physical sciences, and engineering.

I was drawn to this book, and its companion volume 2, as I have been working in areas of image and video analysis and using geometric techniques, and was looking for a handy reference for a broad selection of topics from modern mathematics. As a person with inter-disciplinary research interests spanning computer vision, machine learning, robotics, with a focus on mathematically grounded algorithmic approaches: I find these volumes to be exceedingly useful. Infact, I was pleasantly surprised to see many solutions to problems that I encountered during my work, being stated as 'classical results' in the book.The theme of the book is not like standard math texts, i.e. the focus is not so much on theorem proving, rather the focus is on surveying several related results in a manner approachable to most engineering researchers. But which results to survey, and which not? Chirikjian displays an uncanny knack to survey those results that are practically implementable. This book does not directly connect result and application; but takes one sufficiently close to allow the earnest engineer to make their own connections.In general, I have come to realize that very little of modern mathematics has made its way into modern engineering curriculum (at least electrical engineering to be sure). The volumes by Chirikjian can be very easily used by engineering instructors to introduce more sophisticated mathematics in their courses. I certainly plan to do so in the near future, and these books will in all likelihood will be core texts for such a class.On a broader note, as research becomes more and more interdisciplinary -- requiring engineers to be able to connect dots in non-obvious ways -- mathematical communications of this kind will be extremely important.

I really love this book. It is written in an accessible style and with beautiful rigor.This book achieves a transparent and deep illustration of the mathematics of complex stochastic modelling for well-motivated engineering students. I can pick up and read cover-to-cover without having to carry around twenty other books.In general, many ideas are motivated and then delivered carefully, before the more general result is stated.Moreover, the price is really acceptable for students.I strongly recommend this book to anyone who is interested in stochastic modelling and deep understanding the underlying mathematics without knowledge on probability and measure theory.

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