

Stochastic Modeling And Mathematical Statistics

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Introductory Statistics - Sheldon M. Ross 2010-01-19

Introductory Statistics, Third Edition, presents statistical concepts and techniques in a manner that will teach students not only how and when to utilize the statistical procedures developed, but also to understand why these procedures should be used. This book offers a unique historical perspective, profiling prominent statisticians and historical events in order to motivate learning. To help guide students towards independent learning, exercises and examples using real issues and real data (e.g., stock price models, health issues, gender issues, sports, scientific fraud) are provided. The chapters end with detailed reviews of important concepts and formulas, key terms, and definitions that are useful study tools. Data sets from text and exercise material are available for download in the text website. This text is designed for introductory non-calculus based statistics courses that are offered by mathematics and/or statistics departments to undergraduate students taking a semester course in basic Statistics or a year course in Probability and Statistics. Unique historical perspective profiling prominent statisticians and historical events to motivate learning by providing interest and context Use of exercises and examples helps guide the student towards independent learning using real issues and real data, e.g. stock price models, health issues, gender issues, sports, scientific fraud. Summary/Key Terms- chapters end with detailed reviews of important concepts and formulas, key terms and definitions which are useful to students as study tools

Stochastic Calculus and Stochastic Models - Edward James McShane 1974-01-01

Stochastic Modelling of Electricity and Related Markets - Fred Espen Benth 2008

The markets for electricity, gas and temperature have distinctive features, which provide the focus for countless studies. For instance, electricity and gas prices may soar several magnitudes above their normal levels within a short time due to imbalances in supply and demand, yielding what is known as spikes in the spot prices. The markets are also largely influenced by seasons, since power demand for heating and cooling varies over the year. The incompleteness of the markets, due to nonstorability of electricity and temperature as well as limited storage capacity of gas, makes spot-forward hedging impossible. Moreover, futures contracts are typically settled over a time period rather than at a fixed date. All these aspects of the markets create new challenges when analyzing price dynamics of spot, futures and other derivatives. This book provides a concise and rigorous treatment on the stochastic modeling of energy markets.

Ornstein-Uhlenbeck processes are described as the basic modeling tool for spot price dynamics, where innovations are driven by time-inhomogeneous jump processes. Temperature futures are studied based on a continuous higher-order autoregressive model for the temperature dynamics. The theory presented here pays special attention to the seasonality of volatility and the Samuelson effect. Empirical studies using data from electricity, temperature and gas markets are given to link theory to practice.

Concepts in Probability and Stochastic Models J. Higgins 1995

This text stresses modern ideas, including simulation and interpretation of results. It focuses on the aspects of probability most relevant to applications, such as stochastic modeling, Markov chains, reliability, and queuing.

Stochastic Models of Tumor Latency and Their Biostatistical Applications - Andrej Yu Yakovlev 1996

This research monograph discusses newly developed mathematical models and methods that provide biologically meaningful inferences from data on cancer latency produced by follow-up and discrete

surveillance studies. Methods for designing optimal strategies of cancer surveillance are systematically presented for the first time in this book. It offers new approaches to the stochastic description of tumor latency, employs biologically-based models for making statistical inference from data on tumor recurrence and also discusses methods of statistical analysis of data resulting from discrete surveillance strategies. It also offers insight into the role of prognostic factors based on the interpretation of their effects in terms of parameters endowed with biological meaning, as well as methods for designing optimal schedules of cancer screening and surveillance. Last but not least, it discusses survival models allowing for cure rates and the choice of optimal treatment based on covariate information, and presents numerous examples of real data analysis.

Methods of Mathematical Finance - Ioannis Karatzas 2017-01-10

This sequel to Brownian Motion and Stochastic Calculus by the same authors develops contingent claim pricing and optimal consumption/investment in both complete and incomplete markets, within the context of Brownian-motion-driven asset prices. The latter topic is extended to a study of equilibrium, providing conditions for existence and uniqueness of market prices which support trading by several heterogeneous agents. Although much of the incomplete-market material is available in research papers, these topics are treated for the first time in a unified manner. The book contains an extensive set of references and notes describing the field, including topics not treated in the book. This book will be of interest to researchers wishing to see advanced mathematics applied to finance. The material on optimal consumption and investment, leading to equilibrium, is addressed to the theoretical finance community. The chapters on contingent claim valuation present techniques of practical importance, especially for pricing exotic options.

Stochastic Modeling and Mathematical Statistics - Francisco J. Samaniego 2014-01-14

Provides a Solid Foundation for Statistical Modeling and Inference and Demonstrates Its Breadth of Applicability Stochastic Modeling and Mathematical Statistics: A Text for Statisticians and Quantitative Scientists addresses core issues in post-calculus probability and statistics in a way that is useful for statistics and mathematics majors as well

Mathematical Statistics and Stochastic Processes - Denis Bosq 2013-02-04

Generally, books on mathematical statistics are restricted to the case of independent identically distributed random variables. In this book however, both this case AND the case of dependent variables, i.e. statistics for discrete and continuous time processes, are studied. This second case is very important for today's practitioners. Mathematical Statistics and Stochastic Processes is based on decision theory and asymptotic statistics and contains up-to-date information on the relevant topics of theory of probability, estimation, confidence intervals, non-parametric statistics and robustness, second-order processes in discrete and continuous time and diffusion processes, statistics for discrete and continuous time processes, statistical prediction, and complements in probability. This book is aimed at students studying courses on probability with an emphasis on measure theory and for all practitioners who apply and use statistics and probability on a daily basis.

Textile Engineering - Anindya Ghosh 2021-12-22

Focusing on the importance of the application of statistical techniques, this book covers the design of experiments and stochastic modeling in textile engineering. Textile Engineering: Statistical Techniques, Design of Experiments and Stochastic Modeling focuses on the analysis and interpretation of textile data

for improving the quality of textile processes and products using various statistical techniques. FEATURES Explores probability, random variables, probability distribution, estimation, significance test, ANOVA, acceptance sampling, control chart, regression and correlation, design of experiments and stochastic modeling pertaining to textiles Presents step-by-step mathematical derivations Includes MATLAB® codes for solving various numerical problems Consists of case studies, practical examples and homework problems in each chapter This book is aimed at graduate students, researchers and professionals in textile engineering, textile clothing, textile management and industrial engineering. This book is equally useful for learners and practitioners in other scientific and technological domains.

Advances in Probability and Mathematical Statistics - Daniel Hernández-Hernández 2021-11-14

This volume contains papers which were presented at the XV Latin American Congress of Probability and Mathematical Statistics (CLAPEM) in December 2019 in Mérida-Yucatán, México. They represent well the wide set of topics on probability and statistics that was covered at this congress, and their high quality and variety illustrates the rich academic program of the conference.

Probability, Statistics, and Stochastic Processes for Engineers and Scientists - Aliakbar Montazer Haghighi 2020-07-15

Featuring recent advances in the field, this new textbook presents probability and statistics, and their applications in stochastic processes. This book presents key information for understanding the essential aspects of basic probability theory and concepts of reliability as an application. The purpose of this book is to provide an option in this field that combines these areas in one book, balances both theory and practical applications, and also keeps the practitioners in mind. Features Includes numerous examples using current technologies with applications in various fields of study Offers many practical applications of probability in queueing models, all of which are related to the appropriate stochastic processes (continuous time such as waiting time, and fuzzy and discrete time like the classic Gambler's Ruin Problem) Presents different current topics like probability distributions used in real-world applications of statistics such as climate control and pollution Different types of computer software such as MATLAB®, Minitab, MS Excel, and R as options for illustration, programing and calculation purposes and data analysis Covers reliability and its application in network queues

Level Crossing Methods in Stochastic Models - Percy H. Brill 2008-12-03

From 1972 to 1974, I was working on a PhD thesis entitled Multiple Server Queues with Service Time Depending on Waiting Time. The method of analysis was the embedded Markov chain technique, described in the papers [82] and [77]. My analysis involved lengthy, tedious derivations of systems of integral equations for the probability density function (pdf) of the waiting time. After pondering for many months whether there might be a faster, easier way to derive the integral equations, I finally discovered the basic theorems for such a method in August, 1974. The theorems establish a connection between sample-path level-crossing rates of the virtual wait process and the pdf of the waiting time. This connection was not found anywhere else in the literature at the time. I immediately developed a comprehensive new methodology for deriving the integral equations based on these theorems, and called it system point theory. (Subsequently it was called system point method, or system point level crossing method: SPLC or simply LC.) I rewrote the entire PhD thesis from November 1974 to March 1975, using LC to reach solutions. The new thesis was called System Point Theory in Exponential Queues. On June 12, 1975 I presented an invited talk on the new methodology at the Fifth Conference on Stochastic Processes and their Applications at the University of Maryland. Many queueing theorists were present.

Stochastic Modeling - Barry L. Nelson 2012-10-11

Coherent introduction to techniques also offers a guide to the mathematical, numerical, and simulation tools of systems analysis. Includes formulation of models, analysis, and interpretation of results. 1995 edition.

Stochastic Modeling Nicolas Lanchier 2017-01-27

Three coherent parts form the material covered in this text, portions of which have not been widely covered in traditional textbooks. In this coverage the reader is quickly introduced to several different topics enriched with 175 exercises which focus on real-world problems. Exercises range from the classics of probability theory to more exotic research-oriented problems based on numerical simulations. Intended for

graduate students in mathematics and applied sciences, the text provides the tools and training needed to write and use programs for research purposes. The first part of the text begins with a brief review of measure theory and revisits the main concepts of probability theory, from random variables to the standard limit theorems. The second part covers traditional material on stochastic processes, including martingales, discrete-time Markov chains, Poisson processes, and continuous-time Markov chains. The theory developed is illustrated by a variety of examples surrounding applications such as the gambler's ruin chain, branching processes, symmetric random walks, and queueing systems. The third, more research-oriented part of the text, discusses special stochastic processes of interest in physics, biology, and sociology. Additional emphasis is placed on minimal models that have been used historically to develop new mathematical techniques in the field of stochastic processes: the logistic growth process, the Wright-Fisher model, Kingman's coalescent, percolation models, the contact process, and the voter model. Further treatment of the material explains how these special processes are connected to each other from a modeling perspective as well as their simulation capabilities in C and Matlab™.

Risk and Insurance Søren Asmussen 2020-04-17

This textbook provides a broad overview of the present state of insurance mathematics and some related topics in risk management, financial mathematics and probability. Both non-life and life aspects are covered. The emphasis is on probability and modeling rather than statistics and practical implementation. Aimed at the graduate level, pointing in part to current research topics, it can potentially replace other textbooks on basic non-life insurance mathematics and advanced risk management methods in non-life insurance. Based on chapters selected according to the particular topics in mind, the book may serve as a source for introductory courses to insurance mathematics for non-specialists, advanced courses for actuarial students, or courses on probabilistic aspects of risk. It will also be useful for practitioners and students/researchers in related areas such as finance and statistics who wish to get an overview of the general area of mathematical modeling and analysis in insurance.

Elements of Stochastic Modelling - Konstantin Borovkov 2014-06-30

This is the expanded second edition of a successful textbook that provides a broad introduction to important areas of stochastic modelling. The original text was developed from lecture notes for a one-semester course for third-year science and actuarial students at the University of Melbourne. It reviewed the basics of probability theory and then covered the following topics: Markov chains, Markov decision processes, jump Markov processes, elements of queueing theory, basic renewal theory, elements of time series and simulation. The present edition adds new chapters on elements of stochastic calculus and introductory mathematical finance that logically complement the topics chosen for the first edition. This makes the book suitable for a larger variety of university courses presenting the fundamentals of modern stochastic modelling. Instead of rigorous proofs we often give only sketches of the arguments, with indications as to why a particular result holds and also how it is related to other results, and illustrate them by examples. Wherever possible, the book includes references to more specialised texts on respective topics that contain both proofs and more advanced material. Request Inspection Copy

Stochastic Modelling and Control - Mark Davis 2013-03-08

This book aims to provide a unified treatment of input/output modelling and of control for discrete-time dynamical systems subject to random disturbances. The results presented are of wide applicability in control engineering, operations research, econometric modelling and many other areas. There are two distinct approaches to mathematical modelling of physical systems: a direct analysis of the physical mechanisms that comprise the process, or a 'black box' approach based on analysis of input/output data. The second approach is adopted here, although of course the properties of the models we study, which within the limits of linearity are very general, are also relevant to the behaviour of systems represented by such models, however they are arrived at. The type of system we are interested in is a discrete-time or sampled-data system where the relation between input and output is (at least approximately) linear and where additive random disturbances are also present, so that the behaviour of the system must be investigated by statistical methods. After a preliminary chapter summarizing elements of probability and linear system theory, we introduce in Chapter 2 some general linear stochastic models, both in input/output and state-space form. Chapter 3 concerns filtering theory: estimation of the state of a dynamical system

from noisy observations. As well as being an important topic in its own right, filtering theory provides the link, via the so-called innovations representation, between input/output models (as identified by data analysis) and state-space models, as required for much contemporary control theory.

[Introduction to Stochastic Models](#) - Roe Goodman 2006-01-01

Newly revised by the author, this undergraduate-level text introduces the mathematical theory of probability and stochastic processes. Using both computer simulations and mathematical models of random events, it comprises numerous applications to the physical and biological sciences, engineering, and computer science. Subjects include sample spaces, probabilities distributions and expectations of random variables, conditional expectations, Markov chains, and the Poisson process. Additional topics encompass continuous-time stochastic processes, birth and death processes, steady-state probabilities, general queuing systems, and renewal processes. Each section features worked examples, and exercises appear at the end of each chapter, with numerical solutions at the back of the book. Suggestions for further reading in stochastic processes, simulation, and various applications also appear at the end.

[Probability and Stochastic Models](#) - Vladimir I. Rotar 2012-08-25

A First Course in Probability with an Emphasis on Stochastic Modeling Probability and Stochastic Modeling not only covers all the topics found in a traditional introductory probability course, but also emphasizes stochastic modeling, including Markov chains, birth-death processes, and reliability models. Unlike most undergraduate-level probability texts, the book also focuses on increasingly important areas, such as martingales, classification of dependency structures, and risk evaluation. Numerous examples, exercises, and models using real-world data demonstrate the practical possibilities and restrictions of different approaches and help students grasp general concepts and theoretical results. The text is suitable for majors in mathematics and statistics as well as majors in computer science, economics, finance, and physics. The author offers two explicit options to teaching the material, which is reflected in "routes" designated by special "roadside" markers. The first route contains basic, self-contained material for a one-semester course. The second provides a more complete exposition for a two-semester course or self-study.

An Introduction to Stochastic Modeling - Howard M. Taylor 2014-05-10

An Introduction to Stochastic Modeling provides information pertinent to the standard concepts and methods of stochastic modeling. This book presents the rich diversity of applications of stochastic processes in the sciences. Organized into nine chapters, this book begins with an overview of diverse types of stochastic models, which predicts a set of possible outcomes weighed by their likelihoods or probabilities. This text then provides exercises in the applications of simple stochastic analysis to appropriate problems. Other chapters consider the study of general functions of independent, identically distributed, nonnegative random variables representing the successive intervals between renewals. This book discusses as well the numerous examples of Markov branching processes that arise naturally in various scientific disciplines. The final chapter deals with queueing models, which aid the design process by predicting system performance. This book is a valuable resource for students of engineering and management science. Engineers will also find this book useful.

[Uncertainty Quantification and Stochastic Modeling with Matlab](#) - Eduardo Souza de Cursi 2015-04-09

Uncertainty Quantification (UQ) is a relatively new research area which describes the methods and approaches used to supply quantitative descriptions of the effects of uncertainty, variability and errors in simulation problems and models. It is rapidly becoming a field of increasing importance, with many real-world applications within statistics, mathematics, probability and engineering, but also within the natural sciences. Literature on the topic has up until now been largely based on polynomial chaos, which raises difficulties when considering different types of approximation and does not lead to a unified presentation of the methods. Moreover, this description does not consider either deterministic problems or infinite dimensional ones. This book gives a unified, practical and comprehensive presentation of the main techniques used for the characterization of the effect of uncertainty on numerical models and on their exploitation in numerical problems. In particular, applications to linear and nonlinear systems of equations, differential equations, optimization and reliability are presented. Applications of stochastic methods to deal with deterministic numerical problems are also discussed. Matlab® illustrates the implementation of these methods and makes the book suitable as a textbook and for self-study. Discusses the main ideas of

Stochastic Modeling and Uncertainty Quantification using Functional Analysis Details listings of Matlab® programs implementing the main methods which complete the methodological presentation by a practical implementation Construct your own implementations from provided worked examples

Stability Problems for Stochastic Models: Theory and Applications - Alexander Zeifman 2021-03-05

The aim of this Special Issue of Mathematics is to commemorate the outstanding Russian mathematician Vladimir Zolotarev, whose 90th birthday will be celebrated on February 27th, 2021. The present Special Issue contains a collection of new papers by participants in sessions of the International Seminar on Stability Problems for Stochastic Models founded by Zolotarev. Along with research in probability distributions theory, limit theorems of probability theory, stochastic processes, mathematical statistics, and queuing theory, this collection contains papers dealing with applications of stochastic models in modeling of pension schemes, modeling of extreme precipitation, construction of statistical indicators of scientific publication importance, and other fields.

Probability, Statistics, and Stochastic Processes - Peter Olofsson 2012-05-22

Praise for the First Edition ". . . an excellent textbook . . . well organized and neatly written."

—Mathematical Reviews ". . . amazingly interesting . . ." —Technometrics Thoroughly updated to showcase the interrelationships between probability, statistics, and stochastic processes, Probability, Statistics, and Stochastic Processes, Second Edition prepares readers to collect, analyze, and characterize data in their chosen fields. Beginning with three chapters that develop probability theory and introduce the axioms of probability, random variables, and joint distributions, the book goes on to present limit theorems and simulation. The authors combine a rigorous, calculus-based development of theory with an intuitive approach that appeals to readers' sense of reason and logic. Including more than 400 examples that help illustrate concepts and theory, the Second Edition features new material on statistical inference and a wealth of newly added topics, including: Consistency of point estimators Large sample theory Bootstrap simulation Multiple hypothesis testing Fisher's exact test and Kolmogorov-Smirnov test Martingales, renewal processes, and Brownian motion One-way analysis of variance and the general linear model Extensively class-tested to ensure an accessible presentation, Probability, Statistics, and Stochastic Processes, Second Edition is an excellent book for courses on probability and statistics at the upper-undergraduate level. The book is also an ideal resource for scientists and engineers in the fields of statistics, mathematics, industrial management, and engineering.

[Applied Stochastic Differential Equations](#) - Särkkä 2019-05-02

With this hands-on introduction readers will learn what SDEs are all about and how they should use them in practice.

Identifiability in Stochastic Models - B. L. S. Prakasa Rao 1992

The problem of identifiability is basic to all statistical methods and data analysis, occurring in such diverse areas as reliability theory, survival analysis and econometrics, where stochastic modelling is widely used. Mathematics dealing with identifiability per se is closely related to the so-called branch of characterization problems in probability theory.

Stochastic Models: Analysis and Applications - B. R. Bhat 2004

The Book Presents A Systematic Exposition Of The Basic Theory And Applications Of Stochastic Models.Emphasising The Modelling Rather Than Mathematical Aspects Of Stochastic Processes, The Book Bridges The Gap Between The Theory And Applications Of These Processes.The Basic Building Blocks Of Model Construction Are Explained In A Step By Step Manner, Starting From The Simplest Model Of Random Walk And Proceeding Gradually To More Complicated Models. Several Examples Are Given Throughout The Text To Illustrate Important Analytical Properties As Well As To Provide Applications.The Book Also Includes A Detailed Chapter On Inference For Stochastic Processes. This Chapter Highlights Some Of The Recent Developments In The Subject And Explains Them Through Illustrative Examples.An Important Feature Of The Book Is The Complements And Problems Section At The End Of Each Chapter Which Presents (I) Additional Properties Of The Model, (Ii) Extensions Of The Model, And (Iii) Applications Of The Model To Different Areas.With All These Features, This Is An Invaluable Text For Post-Graduate Students Of Statistics, Mathematics And Operation Research.

[Stochastic Simulation](#) - Brian D. Ripley 2009-09-25

WILEY-INTERSCIENCE PAPERBACK SERIES The Wiley-Interscience Paperback Series consists of selected books that have been made more accessible to consumers in an effort to increase global appeal and general circulation. With these new unabridged softcover volumes, Wiley hopes to extend the lives of these works by making them available to future generations of statisticians, mathematicians, and scientists. ". . .this is a very competently written and useful addition to the statistical literature; a book every statistician should look at and that many should study!" —Short Book Reviews, International Statistical Institute ". . .reading this book was an enjoyable learning experience. The suggestions and recommendations on the methods [make] this book an excellent reference for anyone interested in simulation. With its compact structure and good coverage of material, it [is] an excellent textbook for a simulation course." —Technometrics ". . .this work is an excellent comprehensive guide to simulation methods, written by a very competent author. It is especially recommended for those users of simulation methods who want more than a 'cook book'."

—Mathematics Abstracts This book is a comprehensive guide to simulation methods with explicit recommendations of methods and algorithms. It covers both the technical aspects of the subject, such as the generation of random numbers, non-uniform random variates and stochastic processes, and the use of simulation. Supported by the relevant mathematical theory, the text contains a great deal of unpublished research material, including coverage of the analysis of shift-register generators, sensitivity analysis of normal variate generators, analysis of simulation output, and more.

Stochastic Modeling of Scientific Data - Peter Guttorp 2018-03-29

Stochastic Modeling of Scientific Data combines stochastic modeling and statistical inference in a variety of standard and less common models, such as point processes, Markov random fields and hidden Markov models in a clear, thoughtful and succinct manner. The distinguishing feature of this work is that, in addition to probability theory, it contains statistical aspects of model fitting and a variety of data sets that are either analyzed in the text or used as exercises. Markov chain Monte Carlo methods are introduced for evaluating likelihoods in complicated models and the forward backward algorithm for analyzing hidden Markov models is presented. The strength of this text lies in the use of informal language that makes the topic more accessible to non-mathematicians. The combinations of hard science topics with stochastic processes and their statistical inference puts it in a new category of probability textbooks. The numerous examples and exercises are drawn from astronomy, geology, genetics, hydrology, neurophysiology and physics.

Stochastic Calculus and Stochastic Models - E. J. McShane 2014-07-10

Probability and Mathematical Statistics: A Series of Monographs and Textbooks: Stochastic Calculus and Stochastic Models focuses on the properties, functions, and applications of stochastic integrals. The publication first ponders on stochastic integrals, existence of stochastic integrals, and continuity, chain rule, and substitution. Discussions focus on differentiation of a composite function, continuity of sample functions, existence and vanishing of stochastic integrals, canonical form, elementary properties of integrals, and the Itô-belated integral. The book then examines stochastic differential equations, including existence of solutions of stochastic differential equations, linear differential equations and their adjoints, approximation lemma, and the Cauchy-Maruyama approximation. The manuscript takes a look at equations in canonical form, as well as justification of the canonical extension in stochastic modeling; rate of convergence of approximations to solutions; comparison of ordinary and stochastic differential equations; and invariance under change of coordinates. The publication is a dependable reference for mathematicians and researchers interested in stochastic integrals.

Mathematical Statistics - Jun Shao 2008-02-03

This graduate textbook covers topics in statistical theory essential for graduate students preparing for work on a Ph.D. degree in statistics. This new edition has been revised and updated and in this fourth printing, errors have been ironed out. The first chapter provides a quick overview of concepts and results in measure-theoretic probability theory that are useful in statistics. The second chapter introduces some fundamental concepts in statistical decision theory and inference. Subsequent chapters contain detailed studies on some important topics: unbiased estimation, parametric estimation, nonparametric estimation, hypothesis testing, and confidence sets. A large number of exercises in each chapter provide not only practice problems for students, but also many additional results.

Applied Probability and Stochastic Processes - Frank Beichelt 2018-09-03

Applied Probability and Stochastic Processes, Second Edition presents a self-contained introduction to elementary probability theory and stochastic processes with a special emphasis on their applications in science, engineering, finance, computer science, and operations research. It covers the theoretical foundations for modeling time-dependent random phenomena in these areas and illustrates applications through the analysis of numerous practical examples. The author draws on his 50 years of experience in the field to give your students a better understanding of probability theory and stochastic processes and enable them to use stochastic modeling in their work. New to the Second Edition Completely rewritten part on probability theory—now more than double in size New sections on time series analysis, random walks, branching processes, and spectral analysis of stationary stochastic processes Comprehensive numerical discussions of examples, which replace the more theoretically challenging sections Additional examples, exercises, and figures Presenting the material in a student-friendly, application-oriented manner, this non-measure theoretic text only assumes a mathematical maturity that applied science students acquire during their undergraduate studies in mathematics. Many exercises allow students to assess their understanding of the topics. In addition, the book occasionally describes connections between probabilistic concepts and corresponding statistical approaches to facilitate comprehension. Some important proofs and challenging examples and exercises are also included for more theoretically interested readers.

Stochastic Models, Statistics and Their Applications - Ansgar Steland 2019-10-15

This volume presents selected and peer-reviewed contributions from the 14th Workshop on Stochastic Models, Statistics and Their Applications, held in Dresden, Germany, on March 6-8, 2019. Addressing the needs of theoretical and applied researchers alike, the contributions provide an overview of the latest advances and trends in the areas of mathematical statistics and applied probability, and their applications to high-dimensional statistics, econometrics and time series analysis, statistics for stochastic processes, statistical machine learning, big data and data science, random matrix theory, quality control, change-point analysis and detection, finance, copulas, survival analysis and reliability, sequential experiments, empirical processes, and microsimulations. As the book demonstrates, stochastic models and related statistical procedures and algorithms are essential to more comprehensively understanding and solving present-day problems arising in e.g. the natural sciences, machine learning, data science, engineering, image analysis, genetics, econometrics and finance.

Introduction to Matrix Analytic Methods in Stochastic Modeling - G. Latouche 1999-01-01

Presents the basic mathematical ideas and algorithms of the matrix analytic theory in a readable, up-to-date, and comprehensive manner.

Stochastic Modeling in Economics and Finance - Jitka Dupacova 2006-04-18

In Part I, the fundamentals of financial thinking and elementary mathematical methods of finance are presented. The method of presentation is simple enough to bridge the elements of financial arithmetic and complex models of financial math developed in the later parts. It covers characteristics of cash flows, yield curves, and valuation of securities. Part II is devoted to the allocation of funds and risk management: classics (Markowitz theory of portfolio), capital asset pricing model, arbitrage pricing theory, asset & liability management, value at risk. The method explanation takes into account the computational aspects. Part III explains modeling aspects of multistage stochastic programming on a relatively accessible level. It includes a survey of existing software, links to parametric, multiobjective and dynamic programming, and to probability and statistics. It focuses on scenario-based problems with the problems of scenario generation and output analysis discussed in detail and illustrated within a case study.

Stochastic Modelling of Reaction-Diffusion Processes - Radek Erban 2019-12-31

This practical introduction to stochastic reaction-diffusion modelling is based on courses taught at the University of Oxford. The authors discuss the essence of mathematical methods which appear (under different names) in a number of interdisciplinary scientific fields bridging mathematics and computations with biology and chemistry. The book can be used both for self-study and as a supporting text for advanced undergraduate or beginning graduate-level courses in applied mathematics. New mathematical approaches are explained using simple examples of biological models, which range in size from simulations of small biomolecules to groups of animals. The book starts with stochastic modelling of chemical reactions,

introducing stochastic simulation algorithms and mathematical methods for analysis of stochastic models. Different stochastic spatio-temporal models are then studied, including models of diffusion and stochastic reaction-diffusion modelling. The methods covered include molecular dynamics, Brownian dynamics, velocity jump processes and compartment-based (lattice-based) models.

Simulation and Inference for Stochastic Differential Equations - Stefano M. Iacus 2009-04-27

This book covers a highly relevant and timely topic that is of wide interest, especially in finance, engineering and computational biology. The introductory material on simulation and stochastic differential equation is very accessible and will prove popular with many readers. While there are several recent texts available that cover stochastic differential equations, the concentration here on inference makes this book stand out. No other direct competitors are known to date. With an emphasis on the practical implementation of the simulation and estimation methods presented, the text will be useful to practitioners and students with minimal mathematical background. What's more, because of the many R programs, the information here is appropriate for many mathematically well educated practitioners, too.

Foundations and Methods of Stochastic Simulation - Barry Nelson 2013-01-31

This graduate-level text covers modeling, programming and analysis of simulation experiments and provides a rigorous treatment of the foundations of simulation and why it works. It introduces object-oriented programming for simulation, covers both the probabilistic and statistical basis for simulation in a rigorous but accessible manner (providing all necessary background material); and provides a modern treatment of experiment design and analysis that goes beyond classical statistics. The book emphasizes essential foundations throughout, rather than providing a compendium of algorithms and theorems and prepares the reader to use simulation in research as well as practice. The book is a rigorous, but concise treatment, emphasizing lasting principles but also providing specific training in modeling, programming and analysis. In addition to teaching readers how to do simulation, it also prepares them to use simulation in their research; no other book does this. An online solutions manual for end of chapter exercises is also provided.

Stochastic Modeling and Mathematical Statistics - Francisco J. Samaniego 2014-01-14

Provides a Solid Foundation for Statistical Modeling and Inference and Demonstrates Its Breadth of Applicability *Stochastic Modeling and Mathematical Statistics: A Text for Statisticians and Quantitative Scientists* addresses core issues in post-calculus probability and statistics in a way that is useful for statistics and mathematics majors as well as students in the quantitative sciences. The book's conversational tone, which provides the mathematical justification behind widely used statistical methods in a reader-friendly manner, and the book's many examples, tutorials, exercises and problems for solution, together constitute an effective resource that students can read and learn from and instructors can count on as a worthy complement to their lectures. Using classroom-tested approaches that engage students in active learning, the text offers instructors the flexibility to control the mathematical level of their course. It contains the mathematical detail that is expected in a course for "majors" but is written in a way that emphasizes the intuitive content in statistical theory and the way theoretical results are used in practice.

More than 1000 exercises and problems at varying levels of difficulty and with a broad range of topical focus give instructors many options in assigning homework and provide students with many problems on which to practice and from which to learn.

Stochastic Modelling and Control - Mark Davis 2012-02-13

This book aims to provide a unified treatment of input/output modelling and of control for discrete-time dynamical systems subject to random disturbances. The results presented are of wide applicability in control engineering, operations research, econometric modelling and many other areas. There are two distinct approaches to mathematical modelling of physical systems: a direct analysis of the physical mechanisms that comprise the process, or a 'black box' approach based on analysis of input/output data. The second approach is adopted here, although of course the properties of the models we study, which within the limits of linearity are very general, are also relevant to the behaviour of systems represented by such models, however they are arrived at. The type of system we are interested in is a discrete-time or sampled-data system where the relation between input and output is (at least approximately) linear and where additive random disturbances are also present, so that the behaviour of the system must be investigated by statistical methods. After a preliminary chapter summarizing elements of probability and linear system theory, we introduce in Chapter 2 some general linear stochastic models, both in input/output and state-space form. Chapter 3 concerns filtering theory: estimation of the state of a dynamical system from noisy observations. As well as being an important topic in its own right, filtering theory provides the link, via the so-called innovations representation, between input/output models (as identified by data analysis) and state-space models, as required for much contemporary control theory.

Stochastic Modeling for Reliability - Maxim Finkelstein 2013-04-12

Focusing on shocks modeling, burn-in and heterogeneous populations, *Stochastic Modeling for Reliability* naturally combines these three topics in the unified stochastic framework and presents numerous practical examples that illustrate recent theoretical findings of the authors. The populations of manufactured items in industry are usually heterogeneous. However, the conventional reliability analysis is performed under the implicit assumption of homogeneity, which can result in distortion of the corresponding reliability indices and various misconceptions. *Stochastic Modeling for Reliability* fills this gap and presents the basics and further developments of reliability theory for heterogeneous populations. Specifically, the authors consider burn-in as a method of elimination of 'weak' items from heterogeneous populations. The real life objects are operating in a changing environment. One of the ways to model an impact of this environment is via the external shocks occurring in accordance with some stochastic point processes. The basic theory for Poisson shock processes is developed and also shocks as a method of burn-in and of the environmental stress screening for manufactured items are considered. *Stochastic Modeling for Reliability* introduces and explores the concept of burn-in in heterogeneous populations and its recent development, providing a sound reference for reliability engineers, applied mathematicians, product managers and manufacturers alike.