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

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An Introduction to Stochastic Modeling-Howard M. Taylor 1998-02-20 Serving as the foundation for a one-semester course in stochastic processes for students familiar with elementary probability theory and calculus, Introduction to Stochastic Modeling, Third Edition, bridges the gap between basic probability and an intermediate level course in stochastic processes. The objectives of the text are to introduce students to the standard concepts and methods of stochastic modeling, to illustrate the rich diversity of applications of stochastic processes in the applied sciences, and to provide exercises in the application of simple stochastic analysis to realistic problems. Realistic applications from a variety of disciplines integrated throughout the text Plentiful, updated and more rigorous problems, including computer "challenges" Revised end-of-chapter exercises sets-in all, 250 exercises with answers New chapter on Brownian motion and related processes Additional sections on Martingales and Poisson process

An Introduction to Stochastic Modeling-Mark Pinsky 2011 Serving as the foundation for a one-semester course in stochastic processes for students familiar with elementary probability theory and calculus, Introduction to Stochastic Modeling, Fourth Edition, bridges the gap between basic probability and an intermediate level course in stochastic processes. The objectives of the text are to introduce students to the standard concepts and methods of stochastic modeling, to illustrate the rich diversity of applications of stochastic processes in the applied sciences, and to provide exercises in the application of simple stochastic analysis to realistic problems. New to this edition: Realistic applications from a variety of disciplines integrated throughout the text, including more biological applications Plentiful, completely updated problems Completely updated and reorganized end-of-chapter exercise sets, 250 exercises with answers New chapters of stochastic differential equations and Brownian motion and related processes Additional sections on Martingale and Poisson process Realistic applications from a variety of disciplines integrated throughout the text Extensive end of chapter exercises sets, 250 with answers Chapter 1-9 of the new edition are identical to the previous edition New! Chapter 10 - Random Evolutions New! Chapter 11- Characteristic functions and Their Applications

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.

An Introduction to Stochastic Modeling, Student Solutions Manual (e-only)-Mark Pinsky 2011-03-30 An Introduction to Stochastic Modeling, Student Solutions Manual (e-only)

Stochastic Modelling for Systems Biology, Third Edition-Darren J. Wilkinson 2018-12-07 Since the first edition of Stochastic Modelling for Systems Biology, there have been many interesting developments in the use of "likelihood-free" methods of Bayesian inference for complex stochastic models. Having been thoroughly updated to reflect this, this third edition covers everything necessary for a good appreciation of stochastic kinetic modelling of biological networks in the systems biology context. New methods and applications are included in the book, and the use of R for practical illustration of the algorithms has been greatly extended. There is a brand new chapter on spatially extended systems, and the statistical inference chapter has also been extended with new methods, including approximate Bayesian computation (ABC). Stochastic Modelling for Systems Biology, Third Edition is now supplemented by an additional software library, written in Scala, described in a new appendix to the book. New in the Third Edition New chapter on spatially extended systems, covering the spatial Gillespie algorithm for reaction diffusion master equation models in 1- and 2-d, along with fast approximations based on the spatial chemical Langevin equation Significantly expanded chapter on inference for stochastic kinetic models from data, covering ABC, including ABC-SMC Updated R package, including code relating to all of the new material New R package for parsing SBML models into simulatable stochastic Petri net models New open-source software library, written in Scala, replicating most of the functionality of the R packages in a fast, compiled, strongly typed, functional language Keeping with the spirit of earlier editions, all of the new theory is presented in a very informal and intuitive manner, keeping the text as accessible as possible to the widest possible readership. An effective introduction to the area of stochastic modelling in computational systems biology, this new edition adds additional detail and computational methods that will provide a stronger foundation for the development of more advanced courses in stochastic biological modelling.

Introduction to Modeling and Analysis of Stochastic Systems-V. G. Kulkarni 2010-11-03 This book provides a self-contained review of all the relevant topics in probability theory. A software package called MAXIM, which runs on MATLAB, is made available for downloading. Vidyadhar G. Kulkarni is Professor of Operations Research at the University of North Carolina at Chapel Hill.

An Introduction to Stochastic Modeling-Howard M. Taylor 1994 An Introduction to Stochastic Modeling, Revised Edition 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

Introduction to Stochastic Processes-Erhan Cinlar 2013-02-20 Clear presentation employs methods that recognize computer-related aspects of theory. Topics include expectations and independence, Bernoulli processes and sums of independent random variables, Markov chains, renewal theory, more. 1975 edition.

Stochastic Modelling of Reaction-Diffusion Processes-Radek Erban 2019-12-31 Practical introduction for advanced undergraduate or beginning graduate students of applied mathematics, developed at the University of Oxford.

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 MatlabTM.

Markov Processes for Stochastic Modeling-Oliver Ibe 2013-05-22 Markov processes are processes that have limited memory. In particular, their dependence on the past is only through the previous state. They are used to model the behavior of many systems including communications systems, transportation networks, image segmentation and analysis, biological systems and DNA sequence analysis, random atomic motion and diffusion in physics, social mobility, population studies, epidemiology, animal and insect migration, queueing systems, resource management, dams, financial engineering, actuarial science, and decision systems. Covering a wide range of areas of application of Markov processes, this second edition is revised to highlight the most important aspects as well as the most recent trends and applications of Markov processes. The author spent over 16 years in the industry before returning to academia, and he has applied many of the principles covered in this book in multiple research projects. Therefore, this is an applications-oriented book that also includes enough theory to provide a solid ground in the subject for the reader. Presents both the theory and applications of the different aspects of Markov processes Includes numerous solved examples as well as detailed diagrams that make it easier to understand the principle being presented Discusses different applications of hidden Markov models, such as DNA sequence analysis and speech analysis.

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 Models in Biology-Narendra S. Goel 2016-01-26 Stochastic Models in Biology describes the usefulness of the theory of stochastic process in studying biological phenomena. The book describes analysis of biological systems and experiments though probabilistic models rather than deterministic methods. The text reviews the mathematical analyses for modeling different biological systems such as the random processes continuous in time and discrete in state space. The book also discusses population growth and extinction through Malthus' law and the work of MacArthur and Wilson. The text then explains the dynamics of a population of interacting species. The book also addresses population genetics under systematic evolutionary pressures known as deterministic equations and genetic changes in a finite population known as stochastic equations. The text then turns to stochastic modeling of biological systems at the molecular level, particularly the kinetics of biochemical reactions. The book also presents various useful equations such as the differential equation for generating functions for birth and death processes. The text can prove valuable for biochemists, cellular biologists, and researchers in the medical and chemical field who are tasked to perform data analysis.

Probability and Stochastic Modeling-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.

Introduction to Matrix Analytic Methods in Stochastic Modeling-G. Latouche 1999 Matrix analytic methods are popular as modeling tools because they give one the ability to construct and analyze a wide class of queuing models in a unified and algorithmically tractable way. The authors present the basic mathematical ideas and algorithms of the matrix analytic theory in a readable, up-to-date, and comprehensive manner. In the current literature, a mixed bag of techniques is used-some probabilistic, some from linear algebra, and some from transform methods. Here, many new proofs that emphasize the unity of the matrix analytic approach are included.

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

Stochastic Modelling of Social Processes-Andreas Diekmann 2014-05-10 Stochastic Modelling of Social Processes provides information pertinent to the development in the field of stochastic modeling and its applications in the social sciences. This book demonstrates that stochastic models can fulfill the goals of explanation and prediction. Organized into nine chapters, this book begins with an overview of stochastic models that fulfill normative, predictive, and structural-analytic roles with the aid of the theory of probability. This text then examines the study of labor market structures using analysis of job and career mobility, which is one of the approaches taken by sociologists in research on the labor market. Other chapters consider the characteristic trends and patterns from data on divorces. This book discusses as well the two approaches of stochastic modeling of social processes, namely competing risk models and semi-Markov processes. The final chapter deals with the practical application of regression models of survival data. This book is a valuable resource for social scientists and statisticians.

An Introduction to Stochastic Processes-Edward P.C. Kao 2019-12-18 This incorporation of computer use into teaching and learning stochastic processes takes an applications- and computer-oriented approach rather than a mathematically rigorous approach. Solutions Manual available to instructors upon request. 1997 edition.

An Introduction to Stochastic Dynamics-Jinqiao Duan 2015-04-13 An accessible introduction for applied mathematicians to concepts and techniques for describing, quantifying, and understanding dynamics under uncertainty.

Stochastic Biomathematical Models-Mostafa Bachar 2012-10-19 Stochastic biomathematical models are becoming increasingly important as new light is shed on the role of noise in living systems. In certain biological systems, stochastic effects may even enhance a signal, thus providing a biological motivation for the noise observed in living systems. Recent advances in stochastic analysis and increasing computing power facilitate the analysis of more biophysically realistic models, and this book provides researchers in computational neuroscience and stochastic systems with an overview of recent developments. Key concepts are developed in chapters written by experts in their respective fields. Topics include: one-dimensional homogeneous diffusions and their boundary behavior, large deviation theory and its application in stochastic neurobiological models, a review of mathematical methods for stochastic neuronal integrate-and-fire models, stochastic partial differential equation models in neurobiology, and stochastic modeling of spreading cortical depression.

Introduction to Stochastic Programming-John R. Birge 2006-04-06 This rapidly developing field encompasses many disciplines including operations research, mathematics, and probability. Conversely, it is being applied in a wide variety of subjects ranging from agriculture to financial planning and from industrial engineering to computer networks. This textbook provides a first course in stochastic programming suitable for students with a basic knowledge of linear programming, elementary analysis, and probability. The authors present a broad overview of the main themes and methods of the subject, thus helping students develop an intuition for how to model uncertainty into mathematical problems, what uncertainty changes bring to the decision process, and what techniques help to manage uncertainty in solving the problems. The early chapters introduce some worked examples of stochastic programming, demonstrate how a stochastic model is formally built, develop the properties of stochastic programs and the basic solution techniques used to solve them. The book then goes on to cover approximation and sampling techniques and is rounded off by an in-depth case study. A well-paced and wide-ranging introduction to this subject.

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

A First Course in Stochastic Models-Henk C. Tijms 2003-07-22 The field of applied probability has changed profoundly in the past twenty years. The development of computational methods has greatly contributed to a better understanding of the theory. A First Course in Stochastic Models provides a self-contained introduction to the theory and applications of stochastic models. Emphasis is placed on establishing the theoretical foundations of the subject, thereby providing a framework in which the applications can be understood. Without this solid basis in theory no applications can be solved. Provides an introduction to the use of stochastic models through an integrated presentation of theory, algorithms and applications. Incorporates recent developments in computational probability. Includes a wide range of examples that illustrate the models and make the methods of solution clear. Features an abundance of motivating exercises that help the student learn how to apply the theory. Accessible to anyone with a basic knowledge of probability. A First Course in Stochastic Models is suitable for senior undergraduate and graduate students from computer science, engineering, statistics, operations research, and any other discipline where stochastic modelling takes place. It stands out amongst other textbooks on the subject because of its integrated presentation of theory, algorithms and applications.

Introduction to Stochastic Processes with R-Robert P. Dobrow 2016-03-07 An introduction to stochastic processes through the use of R Introduction to Stochastic Processes with R is an accessible and well-balanced presentation of the theory of stochastic processes, with an emphasis on real-world applications of probability theory in the natural and social sciences. The use of simulation, by means of the popular statistical freeware R, makes theoretical results come alive with practical, hands-on demonstrations. Written by a highly-qualified expert in the field, the author presents numerous examples from a wide array of disciplines, which are used to illustrate concepts and highlight computational and theoretical results. Developing readers' problem-solving skills and mathematical maturity, Introduction to Stochastic Processes with R features: Over 200 examples and 600 end-of-chapter exercises A tutorial for getting started with R, and appendices that contain review material in probability and matrix algebra Discussions of many timely and interesting supplemental topics including Markov chain Monte Carlo, random walk on graphs, card shuffling, Black-Scholes options pricing, applications in biology and genetics, cryptography, martingales, and stochastic calculus Introductions to mathematics as needed in order to suit readers at many mathematical levels A companion website that includes relevant data files as well as all R code and scripts used throughout the book Introduction to Stochastic Processes with R is an ideal textbook for an introductory course in stochastic processes. The book is aimed at undergraduate and beginning graduate-level students in the science, technology, engineering, and mathematics disciplines. The book is also an excellent reference for applied mathematicians and statisticians who are interested in a review of the topic.

Stochastic Modeling and Optimization-David D. Yao 2012-12-06 This books covers the broad range of research in stochastic models and optimization. Applications presented include networks, financial engineering, production planning, and supply chain management. Each contribution is aimed at graduate students working in operations research, probability, and statistics.

Stochastic Models of Financial Mathematics-Vigirdas Mackevicius 2016-11-08 This book presents a short introduction to continuous-time financial models. An overview of the basics of stochastic analysis precedes a focus on the Black-Scholes and interest rate models. Other topics covered include self-financing strategies, option pricing, exotic options and risk-neutral probabilities. Vasicek, Cox-Ingersoll-Ross, and Heath-Jarrow-Morton interest rate models are also explored. The author presents practitioners with a basic introduction, with more rigorous information provided for mathematicians. The reader is assumed to be familiar with the basics of probability theory. Some basic knowledge of stochastic integration and differential equations theory is preferable, although all preliminary information is given in the first part of the book. Some relatively simple theoretical exercises are also provided. About continuous-time stochastic models of financial mathematics Black-Scholes model and interest rate models Requiring a minimum knowledge of stochastic integration and stochastic differential equations

Stochastic Finance-Nicolas Privault 2013-12-20 Stochastic Finance: An Introduction with Market Examples presents an introduction to pricing and hedging in discrete and continuous time financial models without friction, emphasizing the complementarity of analytical and probabilistic methods. It demonstrates both the power and limitations of mathematical models in finance, covering the basics of finance and stochastic calculus, and builds up to special topics, such as options, derivatives, and credit default and jump processes. It details the techniques required to model the time evolution of risky assets. The book discusses a wide range of classical topics including Black-Scholes pricing, exotic and American options, term structure modeling and change of numéraire, as well as models with jumps. The author takes the approach adopted by mainstream mathematical finance in which the computation of fair prices is based on the absence of arbitrage hypothesis, therefore excluding riskless profit based on arbitrage opportunities and basic (buying low/selling high) trading. With 104 figures and simulations, along with about 20 examples based on actual market data, the book is targeted at the advanced undergraduate

and graduate level, either as a course text or for self-study, in applied mathematics, financial engineering, and economics.

An Elementary Introduction to Stochastic Interest Rate Modeling-Nicolas Privault 2012 Interest rate modeling and the pricing of related derivatives remain subjects of increasing importance in financial mathematics and risk management. This book provides an accessible introduction to these topics by a step-by-step presentation of concepts with a focus on explicit calculations. Each chapter is accompanied with exercises and their complete solutions, making the book suitable for advanced undergraduate and graduate level students. This second edition retains the main features of the first edition while incorporating a complete revision of the text as well as additional exercises with their solutions, and a new introductory chapter on credit risk. The stochastic interest rate models considered range from standard short rate to forward rate models, with a treatment of the pricing of related derivatives such as caps and swaptions under forward measures. Some more advanced topics including the BGM model and an approach to its calibration are also covered.

Stochastic Models in Reliability-Terje Aven 2013-08-04 This book provides a comprehensive up-to-date presentation of some of the classical areas of reliability, based on a more advanced probabilistic framework using the modern theory of stochastic processes. This framework allows analysts to formulate general failure models, establish formulae for computing various performance measures, as well as determine how to identify optimal replacement policies in complex situations. In this second edition of the book, two major topics have been added to the original version: copula models which are used to study the effect of structural dependencies on the system reliability; and maintenance optimization which highlights delay time models under safety constraints. Terje Aven is Professor of Reliability and Risk Analysis at University of Stavanger, Norway. Uwe Jensen is working as a Professor at the Institute of Applied Mathematics and Statistics of the University of Hohenheim in Stuttgart, Germany. Review of first edition: "This is an excellent book on mathematical, statistical and stochastic models in reliability. The authors have done an excellent job of unifying some of the stochastic models in reliability. The book is a good reference book but may not be suitable as a textbook for students in professional fields such as engineering. This book may be used for graduate level seminar courses for students who have had at least the first course in stochastic processes and some knowledge of reliability mathematics. It should be a good reference book for researchers in reliability mathematics." --Mathematical Reviews (2000)

Applied Stochastic System Modeling-Shunji Osaki 2012-12-06 This book was written for an introductory one-semester or two-quarter course in stochastic processes and their applications. The reader is assumed to have a basic knowledge of analysis and linear algebra at an undergraduate level. Stochastic models are applied in many fields such as engineering systems, physics, biology, operations research, business, economics, psychology, and linguistics. Stochastic modeling is one of the promising kinds of modeling in applied probability theory. This book is intended to introduce basic stochastic processes: Poisson processes, renewal processes, discrete-time Markov chains, continuous-time Markov chains, and Markov-renewal processes. These basic processes are introduced from the viewpoint of elementary mathematics without going into rigorous treatments. This book also introduces applied stochastic system modeling such as reliability and queueing modeling. Chapters 1 and 2 deal with probability theory, which is basic and prerequisite to the following chapters. Many important concepts of probabilities, random variables, and probability distributions are introduced. Chapter 3 develops the Poisson process, which is one of the basic and important stochastic processes. Chapter 4 presents the renewal process. Renewal theoretic arguments are then used to analyze applied stochastic models. Chapter 5 develops discrete-time Markov chains. Following Chapter 5, Chapter 6 deals with continuous-time Markov chains. Continuous-time Markov chains have important applications to queueing models as seen in Chapter 9. A one-semester course or two-quarter course consists of a brief review of Chapters 1 and 2, followed in order by Chapters 3 through 6.

Introduction to Stochastic Models in Operations Research-Frederick S. Hillier 1990

Stochastic Modeling for Medical Image Analysis-Ayman El-Baz 2015-11-18 Stochastic Modeling for Medical Image Analysis provides a brief introduction to medical imaging, stochastic modeling, and model-guided image analysis. Today, image-guided computer-assisted diagnostics (CAD) faces two basic challenging problems. The first is the computationally feasible and accurate modeling of images from different modalities to obtain clinically useful information. The second is the accurate and fast inferring of meaningful and clinically valid CAD decisions and/or predictions on the basis of model-guided image analysis. To help address this, this book details original stochastic appearance and shape models with computationally feasible and efficient learning techniques for improving the performance of object detection, segmentation, alignment, and analysis in a number of important CAD applications. The book demonstrates accurate descriptions of visual appearances and shapes of the goal objects and their background to help solve a number of important and challenging CAD problems. The models focus on the first-order marginals of pixel/voxel-wise signals and second- or higher-order Markov-Gibbs random fields of these signals and/or labels of regions supporting the goal objects in the lattice. This valuable resource presents the latest state of the art in stochastic modeling for medical image analysis while incorporating fully tested experimental results throughout.

Stochastic Finance-Hans Föllmer 2016-07-25 This book is an introduction to financial mathematics. It is intended for graduate students in mathematics and for researchers working in academia and industry. The focus on stochastic models in discrete time has two immediate benefits. First, the probabilistic machinery is simpler, and one can discuss right away some of the key problems in the theory of pricing and hedging of financial derivatives. Second, the paradigm of a complete financial market, where all derivatives admit a perfect hedge, becomes the exception rather than the rule. Thus, the need to confront the intrinsic risks arising from market incompleteness appears at a very early stage. The first part of the book contains a study of a simple one-period model, which also serves as a building block for later developments. Topics include the characterization of arbitrage-free markets, preferences on asset profiles, an introduction to equilibrium analysis, and monetary measures of financial risk. In the second part, the idea of dynamic hedging of contingent claims is developed in a multiperiod framework. Topics include martingale measures, pricing formulas for derivatives, American options, superhedging, and hedging strategies with minimal shortfall risk. This fourth, newly revised edition contains more than one hundred exercises. It also includes material on risk measures and the related issue of model uncertainty, in particular a chapter on dynamic risk measures and sections on robust utility maximization and on efficient hedging with convex risk measures. Contents: Part I: Mathematical finance in one period Arbitrage theory Preferences Optimality and equilibrium Monetary measures of risk Part II: Dynamic hedging Dynamic arbitrage theory American contingent claims Superhedging Efficient hedging Hedging under constraints Minimizing the hedging error Dynamic risk measures

Stochastic Processes-Peter Watts Jones 2017-10-30 Based on a well-established and popular course taught by the authors over many years, Stochastic Processes: An Introduction, Third Edition, discusses the modelling and analysis of random experiments, where processes evolve over time. The text begins with a review of relevant fundamental probability. It then covers gambling problems, random walks, and Markov chains. The authors go on to discuss random processes continuous in time, including Poisson, birth and death processes, and general population models, and present an extended discussion on the analysis of associated stationary processes in queues. The book also explores reliability and other random processes, such as branching, martingales, and simple epidemics. A new chapter describing Brownian motion, where the outcomes are continuously observed over continuous time, is included. Further applications, worked examples and problems, and biographical details have been added to this edition. Much of the text has been reworked. The appendix contains key results in probability for reference. This concise, updated book makes the material accessible, highlighting simple applications and examples. A solutions manual with fully worked answers of all end-of-chapter problems, and Mathematica® and R programs illustrating many processes discussed in the book, can be downloaded from crcpress.com.

An Introduction to Differential Equations-Anil G. Ladde 2013 For more than half a century, stochastic calculus and stochastic differential equations have played a major role in analyzing the dynamic phenomena in the biological and physical sciences, as well as engineering. The advancement of knowledge in stochastic differential equations is spreading rapidly across the graduate and postgraduate programs in universities around the globe. This will be the first available book that can be used in any undergraduate/graduate stochastic modeling/applied mathematics courses and that can be used by an interdisciplinary researcher with a minimal academic background. An Introduction to Differential Equations: Volume 2 is a stochastic version of Volume 1 ("An Introduction to Differential Equations: Deterministic Modeling, Methods and Analysis"). Both books have a similar design, but naturally, differ by calculi. Again, both volumes use an innovative style in the presentation of the topics, methods and concepts with adequate preparation in deterministic Calculus.

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.

A Course in Stochastic Processes-Denis Bosq 2013-03-09 This text is an Elementary Introduction to Stochastic Processes in discrete and continuous time with an initiation of the statistical inference. The material is standard and classical for a first course in Stochastic Processes at the senior/graduate level (lessons 1-12). To provide students with a view of statistics of stochastic processes, three lessons (13-15) were added. These lessons can be either optional or serve as an introduction to statistical inference with dependent observations. Several points of this text need to be elaborated, (1) The pedagogy is somewhat obvious. Since this text is designed for a one semester course, each lesson can be covered in one week or so. Having in mind a mixed audience of students from different departments (Mathematics, Statistics, Economics, Engineering, etc.) we have presented the material in each lesson in the most simple way, with emphasis on motivation of concepts, aspects of applications and

computational procedures. Basically, we try to explain to beginners questions such as "What is the topic in this lesson?" "Why this topic?", "How to study this topic mathematically?". The exercises at the end of each lesson will deepen the students' understanding of the material, and test their ability to carry out basic computations. Exercises with an asterisk are optional (difficult) and might not be suitable for homework, but should provide food for thought.

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.