Stochastic Fuzzy Differential Equations With An Application

The book provides insights in the decision-making for implementing strategies in various spheres of real-world issues. It integrates optimal policies in various decisionmaking problems and serves as a reference for researchers and industrial practitioners. Furthermore, the book provides sound knowledge of modelling of real-world problems and solution procedure using the various optimisation and statistical techniques for making optimal decisions. The book is meant for teachers, students, researchers and industrialists who are working in the field of materials science, especially operations research and applied statistics.


One of the main aims of this book is to exhibit some fruitful links between renewal theory and regular variation of functions. Applications of renewal processes play a key role in actuarial and financial mathematics as well as in engineering, operations research and other fields of applied mathematics. On the other hand, regular variation of functions is a property that features prominently in many fields of mathematics. The structure of the book reflects the historical development of the authors’ research work and approach – first some applications are discussed, after which a basic theory is created, and finally further applications are provided. The authors present a generalized and unified approach to the asymptotic behavior of renewal processes, involving cases of dependent inter-arrival times. This method works for other important functionals as well, such as first and last exit times or sojourn times (also under dependencies), and it can be used to solve several other problems. For example, various applications in function analysis concerning Abelian and Tauberian theorems can be studied as well as those in studies of the asymptotic behavior of solutions of stochastic differential equations. The classes of functions that are investigated and used in a probabilistic context extend the well-known Karamata theory of regularly varying functions and thus are also of interest in the theory of functions. The book provides a rigorous treatment of the subject and may serve as an introduction to the field. It is aimed at researchers and students working in probability, the theory of stochastic processes, operations research, mathematical statistics, the theory of functions, analytic number theory and complex analysis, as well as economists with a mathematical background. Readers should have completed introductory courses in analysis and probability theory.

Safety, Reliability, Risk and Life-Cycle Performance of Structures and Infrastructures contains the plenary lectures and papers presented at the 11th International Conference on STRUCTURAL SAFETY AND RELIABILITY (ICOSSAR2013, New York, NY, USA, 16-20 June 2013), and covers major aspects of safety, reliability, risk and life-cycle performance of structures.

Analysis and Synthesis of Polynomial Discrete-time Systems: An SOS Approach addresses the analysis and design of polynomial discrete-time control systems. The book deals with the application of Sum of Squares techniques in solving specific control and filtering problems that can be useful to solve advanced control problems, both on the theoretical side and on the practical side. Two types of controllers, state feedback controller and output feedback controller, along with topics surrounding the nonlinear filter and the H-infinity performance criteria are explored. The book also proposes a solution to global stabilization of discrete-time systems. Presents recent developments of the Sum of Squares in control of Polynomial Discrete-time Systems includes numerical and practical examples to illustrate how design methodologies can be applied Provides a methodology for robust output controller design with an H-infinity performance index for polynomial discrete-time systems Offers tools for the analysis and design of control processes where the process can be represented in polynomial form Uses the Sum of Squares method for solving controller and filter design problems Provides MATLAB® code and simulation files of all illustrated example

An original, systematic-solution approach to uncertain nonlinear systems control and modeling using fuzzy equations and fuzzy differential equations There are various numerical and analytical approaches to the modeling and control of uncertain nonlinear systems. Fuzzy logic theory is an increasingly popular method used to solve inconvenience problems in nonlinear modeling. Modeling and Control of Uncertain Nonlinear Systems with Fuzzy Equations and Z-Number presents a structured approach to the control and modeling of uncertain nonlinear systems in industry using fuzzy equations and fuzzy differential equations. The first major work to explore methods based on neural networks and Bernstein neural networks, this innovative volume provides a framework for control and modeling of uncertain nonlinear systems with applications to industry. Readers learn how to use fuzzy techniques to solve scientific and engineering problems and understand intelligent control design and applications. The text assembles the results of four years of research on control of uncertain nonlinear systems with dual fuzzy equations, fuzzy modeling for uncertain nonlinear systems with fuzzy equations, the numerical solution of fuzzy equations with Z-numbers, and the numerical solution of fuzzy differential equations with Z-numbers. Using clear and accessible language to explain concepts and principles applicable to real-world scenarios, this book: Presents the modeling and control of uncertain nonlinear systems with fuzzy equations and fuzzy differential equations includes an overview of uncertain nonlinear systems for non-specialists Teaches readers to use simulation, modeling and verification skills valuable for scientific research and engineering systems development Reinforces comprehension with illustrations, tables, examples, and simulations Modeling and Control of Uncertain Nonlinear Systems with Fuzzy Equations and Z-Number is suitable as a textbook for advanced students, academic and industrial researchers, and practitioners in fields of systems engineering, learning control systems, neural networks, computational intelligence, and fuzzy logic control.
This book brings together the contributions of leading researchers in the field of machine intelligence, covering areas such as fuzzy logic, neural networks, evolutionary computation and hybrid systems. There is wide coverage of the subject from simple tools, through industrial applications, to applications in high-level intelligent systems which are biologically motivated, such as humanoid robots (and selected parts of these systems, like the visual cortex). Readers will gain a comprehensive overview of the issues in machine intelligence, an area which promises to play a very important role in the information society of the future.

Table of contents: Stochastic methods in nonlinear structural dynamics.- Stochastic models of uncertainties in computational structural dynamics and structural acoustics.- The tale of stochastic linearization techniques: over half a century of progress.- Comprehensive modeling of uncertain systems using fuzzy set theory.- Bounding uncertainty in civil engineering: theoretical background and applications.- Combined methods in nondeterministic mechanics. In this book the current state of the art of nondeterministic mechanics in its various forms is presented. The topics range from stochastic problems to fuzzy sets; from linear to nonlinear problems; from specific methodologies to combinations of various techniques; from theoretical considerations to practical applications. It is specially designed to illuminate the various aspects of the three methodologies (probabilistic or stochastic modelling, fuzzy sets based analysis, antioptimization of structures) to deal with various uncertainties and deepen the discussion of their pros and cons.

The International Conference on Differential Equations and Nonlinear Mechanics was hosted by the University of Central Florida in Orlando from March 17-19, 1999. One of the conference days was dedicated to Professor V. Lakshmikantham in th honor of his 75 birthday. 50 well established professionals (in differential equations, nonlinear analysis, numerical analysis, and nonlinear mechanics) attended the conference from 13 countries. Twelve of the attendees delivered hour long invited talks and remaining thirty-eight presented invited forty-five minute talks. In each of these talks, the focus was on the recent developments in differential equations and nonlinear mechanics and their applications. This book consists of 29 papers based on the invited lectures, and I believe that it provides a good selection of advanced topics of current interest in differential equations and nonlinear mechanics. I am indebted to the Department of Mathematics, College of Arts and Sciences, Department of Mechanical, Materials and Aerospace Engineering, and the Office of International Studies (of the University of Central Florida) for the financial support of the conference. Also, to the Mathematics Department of the University of Central Florida for providing secretarial and administrative assistance. I would like to thank the members of the local organizing committee, Jeanne Blank, Jackie Callahan, John Cannon, Holly Carley, Brad Pyle, Pete Rautenstrauch, and June Wingler for their assistance. Thanks are also due to the conference organizing committee, F. H. Busse, J. R. Cannon, V. Girault, R. H. J. Grimshaw, P. N. Kaloni, V.

ECMI, the European Consortium for Mathematics in Industry, is the European brand associated with applied mathematics for industry and organizes highly successful biannual conferences. In this series, the ECMI 2010, the 16th European Conference on Mathematics for Industry, was held in the historic city hall of Wuppertal in Germany. It covered the mathematics of a wide range of applications and methods, from circuit and electromagnetic device simulation to model order reduction for chip design, uncertainties and stochastics, production, fluids, life and environmental sciences, and dedicated and versatile methods. These proceedings of ECMI 2010 emphasize mathematics as an innovation enabler for industry and business, and as an absolutely essential pre-requisite for Europe on its way to becoming the leading knowledge-based economy in the world.

This volume is a collection of papers presented at the international conference on Nonlinear Mathematics for Uncertainty and Its Applications (NLUMA2011), held at Beijing University of Technology during the week of September 7–9, 2011. The conference brought together leading researchers and practitioners involved with all aspects of nonlinear mathematics for uncertainty and its applications. Over the last fifty years there have been advances in extending the theory of classical probability and statistical models to the generalized one which can cope with problems of inference and decision making when the model-related information is scarce, vague, ambiguous, or incomplete. Such attempts include the study of nonadditive measures and their integrals, imprecise probabilities and random sets, and their applications in information sciences, economics, finance, insurance, engineering, and social sciences. The book presents topics including nonadditive measures and nonlinear integrals, Choquet, Sugeno and other types of integrals, possibility theory, Dempster-Shafer theory, random sets, fuzzy random sets and related statistics, set-valued and fuzzy stochastic processes, imprecise probability theory and related statistical models, fuzzy mathematics, nonlinear functional analysis, information theory, mathematical finance and risk managements, decision making under various types of uncertainty, and others.

This book constitutes the refereed proceedings of the 6th International Conference on Intelligent Computing, ICIC 2010, held in Changsha, China, in August 2010. The 85 revised full papers presented were carefully reviewed and selected from a number of submissions. The papers are organized in topical sections on neural networks, evolutionary learning & genetic algorithms, fuzzy theory and models, fuzzy systems and soft computing, particle swarm optimization and niche technology, supervised & semi-supervised learning, unsupervised & reinforcement learning, combinatorial & numerical optimization, systems biology and computational biology, neural computing and optimization, nature inspired computing and optimization, knowledge discovery and data mining, artificial life and artificial immune systems, intelligent computing in image processing, special session on new hand biometric methods, special section on recent advances in image segmentation, special session on theories and applications in advanced intelligent computing, special session on search based software engineering, special section on bio-inspired computing and applications, special session on advance in dimensionality reduction methods and its applications, special session on protein and gene bioinformatics: methods and applications.

Intelligent engineering systems try to replicate fundamental abilities of humans and nature in order to achieve sufficient progress in solving complex problems. In an ideal case multi-disciplinary applications of different modern engineering fields can result in synergistic effects. Information technology and computer modeling are the underlying tools that play a major role at any stages of developing intelligent systems. Chapters in the present volume have been written by eminent scientists of different parts of the world, dealing with challenging problems for efficient modeling of intelligent systems. The reader can find different characteristics and methodologies of computational intelligence with real life applications. Various facets of intelligent engineering and information technology are addressed. Starting with theoretical issues from pseudo-analysis to parametric classes of digital fuzzy conjunctions for hardware implementation of fuzzy systems, diverse aspects of control including quantum as well as fuzzy control and hybrid approaches, intelligent robotics dealing with mobile and autonomous robots and new trends, approaches and results on information technology, machines, materials and manufacturing, and issues of intelligent systems and complex processes are covered.

This book comprises a selection of papers from IFSA 2007 on new methods and theories that contribute to the foundations of fuzzy logic and soft computing. Coverage includes the application of fuzzy logic and soft computing in flexible querying, philosophical and human-scientific aspects of soft computing, search engine and information processing and retrieval, as well as intelligent agents and knowledge ant colony.

This volume is a collection of some of the most significant mathematical works of Prof Richard E Bellman. Ten areas of Prof Bellman's mathematical research were selected by his co-workers for this volume.
Each chapter starts with an introductory comment on the significance of Bellman's contribution. Some important mathematical theories are put forward and their applications in physics and biology such as the mathematical aspect of chemotherapy and the analysis of biological systems are included in this book. Contents: Richard Ernest BellmanDynamic ProgrammingDifferential-Difference EquationsInvariant ImbeddingRadiative TransferMathematical BiologyQuasilinearizationStochastic Processes and Stochastic Differential EquationsThe Identification of SystemsMathematics, Man and Society Readership: Mathematicians, mathematical physicists and mathematical biologists. Keywords: Dynamic Programming; Differential Difference Equations; Invariant Embedding; Radiative Transfer; Quasilinearization; Stochastic Processes; Identification of Systems Review: "This is a very useful book for the historian of mathematics, biographer, etc. There is a unique opportunity for historical, biographical and mathematical perspective to emerge. "Mathematics Abstracts

This book presents a forecasting mechanism of the price intervals for deriving the SCR (solvency capital requirement) eradicating the risk during the exercise period on one hand and measuring the risk by computing the hedging exit function associating with smaller investments the date until which the value of the portfolio hedges the liabilities on the other. This information, summarized under the term “tachastic viability measure of risk” is an evolutionary alternative to statistical measures, when dealing with evolutions under uncertainty. The book is written by experts in the field and the target audience primarily comprises research experts and practitioners.

As the systems which form the fabric of modern society become more complex and more interdependent, the need for the understanding of the behavior of such systems becomes increasingly more essential. What are the causes and possible cures for the worldwide inflation which is posing a serious threat to the economic stability and social order of both developed and underdeveloped countries? What are the trade-offs between the urgent need for additional sources of energy and the risks posed by the proliferation of nuclear reactors? How can one devise mass transportation systems which are fast, confortable, convenient, and yet not prohibitively expensive? These issues are but some of the more visible problems posed by what might be called the crisis of undercoordination—a crisis rooted in the worldwide spread of modern society and the degree of coordination which libertarian societies are still unable to tolerate. The disquieting implication of this crisis is that to achieve stability through coordination may necessitate the imposition of pervasive controls which may be hard to accept by societies steeped in the democratic tradition. Viewed in this perspective, the need for developing a better understanding of the behavior of large-scale societal systems presents a problem of much more than purely academic importance. Over the last forty years there has been a growing interest to extend probability theory and statistics and to allow for more flexible modelling of imprecision, uncertainty, vagueness and ignorance. The fact that in many real-life situations data uncertainty is not only present in the form of randomness (stochastic uncertainty) but also in the form of imprecision/fuzziness is but one point underlining the need for a widening of statistical tools. Many such extensions originate in a “softening” of classical methods, allowing, in particular, to work with imprecise or vague data, considering imprecise or generalized probabilities and fuzzy events, etc. About ten years ago the idea of establishing a recurrent forum for discussing new trends in the before-mentioned context was born and resulted in the first International Conference on Soft Methods in Probability and Statistics (SMPS) that was held in Warsaw in 2002. In the following years the conference took place in Oviedo (2004), in Bristol (2006) and in Toulouse (2008). In the current edition the conference returns to Oviedo. This edited volume is a collection of papers presented at the SMPS 2010 conference held in Mieres and Oviedo. It gives a comprehensive overview of current research into the fusion of soft methods with probability and statistics.

This book constitutes an up-to-date account of principles, methods, and tools for mathematical and statistical modelling in a wide range of research fields, including medicine, health sciences, biology, environmental science, engineering, physics, chemistry, computation, finance, economics, and social sciences. It presents original solutions to real-world problems, emphasizes the coordinated development of theories and applications, and promotes interdisciplinary collaboration among mathematicians, statisticians, and researchers in other disciplines. Based on a highly successful meeting, the International Conference on Applied Mathematics, Modeling and Computational Science, AMMCS 2019, held from August 18 to 23, 2019, on the main campus of Wilfrid Laurier University, Waterloo, Canada, the contributions are the results of submissions from the conference participants. They provide readers with a broader view of the methods, ideas and tools used in mathematical, statistical and computational sciences.

This book gathers the proceedings of “Engineer of the XXI Century: The VIII Inter-University Conference of Students, PhD Students and Young Scientists”, which was held at the University of Bielsko-Biała (ATH), Poland, on the 8th of December 2017. The event highlighted outstanding research on mechatronics in the broadest sense, while also promoting cooperation among students and young scientists from around the globe. Topic areas covered include: mechanics and machine building, automation and robotics, mechatronics, production engineering and management, and informatics/computer science. This book constitutes the thoroughly refereed proceedings of the 37th IFSA Conference, NAFIPS 2018, held in Fortaleza, Brazil, in July 2018. The 55 full papers presented were carefully reviewed and selected from 73 submissions. The papers deal with a large spectrum of topics, including theory and applications of fuzzy numbers and sets, fuzzy logic, fuzzy inference systems, fuzzy clustering, fuzzy pattern classification, neuro-fuzzy systems, fuzzy control systems, fuzzy modeling, fuzzy mathematical morphology, fuzzy dynamical systems, time series forecasting, and making decision under uncertainty. During last decade significant progress has been made in the oil indus try by using soft computing technology. Underlying this evolving technology there have, been ideas transforming the very language we use to describe problems with imprecision, uncertainty and partial truth. These developments offer exciting opportunities, but at the same time it is becoming clearer that further advancements are confronted by funda mental problems. The whole idea of how human process information lies at the core of the challenge. There are already new ways of thinking about the problems within theory of perception-based information. This theory aims to understand and harness the laws of human perceptions to dramatically improve the processing of information. A matured theory of perception-based information is likely to be proper positioned to contribute to the solution of the problems and provide all the ingredients for a revolution in science, technology and business. In this context, Berkeley Initiative in Soft Computing (BISC), University of California, Berkeley from one side and State of the Art Assessment and New Directions for Research to understand the signifcance of the fields accomplishments, new developments and future directions. The Technical Committee selected and invited 15 scientists (and oil indus try experts as technical committee members) from the related disciplines to participate in the Meeting, which took place at the University of California, Berkeley, and March 15-17, 2002. This book introduces the principle theories and applications of control and filtering problems to address emerging hot topics in feedback systems. With the development of IT technology at the core of the 4th industrial revolution, dynamic systems are becoming more sophisticated, networked, and advanced to achieve even better performance. However, this evolutionary advance in dynamic systems also leads to unavoidable constraints. In particular, such elements in control systems involve uncertainties, communication/transmission delays, external noise, sensor faults and failures, data packet dropouts, sampling and quantization errors, and switching phenomena, which have serious effects on the system's stability and performance. This book discusses how to deal with such constraints to guarantee the system's design objectives, focusing on real-world dynamical systems such as Markovian jump systems, networked control systems, neural networks, and complex networks, which have recently excited considerable attention. It also provides a number of practical examples to show the applicability of the presented methods and techniques. This book is of interest to graduate students, researchers and professors, as well
as R&D engineers involved in control theory and applications looking to analyze dynamical systems with constraints and to synthesize various types of corresponding controllers and filters for optimal performance of feedback systems.

Studies in the Economics of Aging is the fourth book in a series from the National Bureau of Economic Research that addresses economic issues in aging and retirement. Building on the research in The Economics of Aging (1989), Issues in the Economics of Aging (1990), and Topics in the Economics of Aging (1992), this volume examines elderly population growth and government spending, life expectancy and health, saving for retirement and housing values, aging in Germany and Taiwan, and the utilization of nursing home and other long-term care.

Volume 9 of the series presents 38 technical papers covering a wide range of environmental issues, including Bioremediation, Chemical Oxidation, Heavy Metals, MTBE, Phytoremediation, Radiation, Regulatory and Legal issues, Remediation, Risk Based Cleanup and Site Assessment. Contributing authors are drawn from across the spectrum of interest: government agencies, academic institutions, the consulting community and industrial companies.

Aimed at the community of mathematicians working on ordinary and partial differential equations, difference equations, and functional equations, this book contains selected papers based on the presentations at the International Conference on Differential & Difference Equations and Applications (ICDDEA) 2015, dedicated to the memory of Professor Georg Sell. Contributions include new trends in the field of differential and difference equations, applications of differential and difference equations, as well as high-level survey results. The main aim of this recurring conference series is to promote, encourage, cooperate, and bring together researchers in the fields of differential & difference equations. All areas of differential and difference equations are represented, with special emphasis on applications.

This book consists of select proceedings of the National Conference on Wave Mechanics and Vibrations (WMVC 2018). It covers recent developments and cutting-edge methods in wave mechanics and vibrations applied to a wide range of engineering problems. The book presents analytical and computational studies in structural mechanics, seismology and earthquake engineering, mechanical engineering, aeronautics, robotics and nuclear engineering among others. This book can be useful for students, researchers, and professionals interested in the wide-ranging applications of wave mechanics and vibrations.

This book includes research studies, novel theory, as well as new methodology and applications in mathematics and management sciences. The book will provide a comprehensive range of mathematics applied to engineering areas for different tasks. It will offer an international perspective and a bridge between classical theory and new methodology in many areas, along with real-life applications. Features Offers solutions to multi-objective transportation problem under cost reliability using utility function

Presents optimization techniques to support eco-efficiency assessment in manufacturing processes Covers distance-based function approach for optimal design of engineering processes with multiple quality characteristics Provides discrete time sliding mode control for non-linear networked control systems Discusses second law of thermodynamics as instruments for optimizing fluid dynamic systems and aerodynamic systems

This open access book was prepared as a Final Publication of the COST Action IC1406 “High-Performance Modelling and Simulation for Big Data Applications (cHiPSet)” project. Long considered important pillars of the scientific method, Modelling and Simulation have evolved from traditional discrete numerical methods to complex data-intensive continuous analytical optimisations. Resolution, scale, and accuracy have become essential to predict and analyse natural and complex systems in science and engineering.

When their level of abstraction raises to have a better discernment of the domain at hand, their representation gets increasingly demanding for computational and data resources. On the other hand, High Performance Computing typically entails the effective use of parallel and distributed processing units coupled with efficient storage, communication and visualisation systems to underpin complex data-intensive applications in distinct scientific and technical domains. It is then arguably required to have a seamless interaction of High Performance Computing with Modelling and Simulation in order to store, compute, analyse, and visualise large data sets in science and engineering. Funded by the European Commission, cHiPSet has provided a dynamic trans-European forum for their members and distinguished guests to openly discuss novel perspectives and topics of interests for these two communities. This cHiPSet compendium presents a set of selected case studies related to healthcare, biological data, computational advertising, multimedia, finance, bioinformatics, and telecommunications.

In May 2002 a number of about 20 scientists from various disciplines were invited by the Berlin-Brandenburg Academy of Sciences and Humanities to participate in an interdisciplinary workshop on structures and structure generating processes. The site was the beautiful little castle of Blankensee, south of Berlin. The disciplines represented ranged from mathematics and information theory, over various fields of engineering, biochemistry and biology, to the economic and social sciences. All participants presented talks explaining the nature of structures considered in their fields and the associated procedures of analysis. It soon became evident that the study of structures is indeed a common concern of virtually all disciplines. The motivation as well as the methods of analysis, however, differ considerably. In engineering, the generation of artifacts, such as infrastructures or technological processes, are of primary interest. Frequently, the analysis aims there at defining a simplified mathematical model for the optimization of the structures and the structure generating processes. Mathematical or heuristic methods are applied, the latter preferably of the type of biology based evolutionary algorithms. On the other hand, setting up complex technical structures is not possible by such simplified model calculations but requires a different and less model but rather knowledge-based type of approach, using empirical rules rather than formal equations. In biochemistry, interest is frequently focussed on the structures of molecules, such as proteins or ribonucleic acids. Again, optimal structures can usually be defined.
This Encyclopedia of Control Systems, Robotics, and Automation is a component of the global Encyclopedia of Life Support Systems EOLSS, which is an integrated compendium of twenty one Encyclopedias. This 22-volume set contains 240 chapters, each of size 5000-30000 words, with perspectives, applications and extensive illustrations. It is the only publication of its kind carrying state-of-the-art knowledge in the fields of Control Systems, Robotics, and Automation and is aimed, by virtue of the several applications, at the following five major target audiences: University and College Students, Educators, Professional Practitioners, Research Personnel and Policy Analysts, Managers, and Decision Makers and NGOs.

Sparse grids are a popular tool for the numerical treatment of high-dimensional problems. Where classical numerical discretization schemes fail in more than three or four dimensions, sparse grids, in their different flavors, are frequently the method of choice. This volume of LNCSE presents selected papers from the proceedings of the fourth workshop on sparse grids and applications, and demonstrates once again the importance of this numerical discretization scheme. The articles present recent advances in the numerical analysis of sparse grids in connection with a range of applications including computational chemistry, computational fluid dynamics, and big data analytics, to name but a few.

This book is a compendium of fundamental mathematical concepts, methods, models, and their wide range of applications in diverse fields of engineering. It comprises essentially a comprehensive and contemporary coverage of those areas of mathematics which provide foundation to electronic, electrical, communication, petroleum, chemical, civil, mechanical, biomedical, software, and financial engineering. It gives a fairly extensive treatment of some of the recent developments in mathematics which have found very significant applications to engineering problems.

Since the beginning of the 1980's, a lot of news approaches of biomimetic inspiration have been defined and developed for imitating the brain behavior, for modeling non linear phenomenon, for providing new hardware architectures, for solving hard problems. They are named Neural Networks, Multilayer Perceptrons, Genetic algorithms, Cellular Automates, Self-Organizing maps, Fuzzy Logic, etc. They can be summarized by the word of Connectionism, and consist of an interdisciplinary domain between neuroscience, cognitive science and engineering. First they were applied in computer sciences, engineering, biological models, pattern recognition, motor control, learning algorithms, etc. But rapidly, it appeared that these methods could be of great interest in the fields of Economics and Management Sciences. The main difficulty was the distance between researchers, the difference in the vocabulary used by the ones and the others, their basic background. The main notions used by these new techniques were not familiar to the Social and Human Sciences researchers. What are they ? Four of them are now very briefly introduced, but the reader will find more information in the following chapters.

This book presents the state of the art in the relatively new field of dynamic economic modelling with regime switches. The contributions, written by prominent scholars in the field, focus on dynamic decision problems with regime changes in underlying dynamics or objectives. Such changes can be externally driven or internally induced by decisions. Utilising the most advanced mathematical methods in optimal control and dynamic game theory, the authors address a broad range of topics, including capital accumulation, innovations, financial decisions, population economics, environmental and resource economics, institutional change and the dynamics of addiction. Given its scope, the book will appeal to all scholars interested in mathematical and quantitative economics.

The subject of fractional calculus has gained considerable popularity and importance during the past three decades, mainly due to its validated applications in various fields of science and engineering. It is a generalization of ordinary differentiation and integration to arbitrary (non-integer) order. The fractional derivative has been used in various physical problems, such as frequency-dependent damping behavior of structures, biological systems, motion of a plate in a Newtonian fluid, PID? controller for the control of dynamical systems, and so on. It is challenging to obtain the solution (both analytical and numerical) of related nonlinear partial differential equations of fractional order. So for the last few decades, a great deal of attention has been directed towards the solution for these kind of problems. Different methods have been developed by other researchers to analyze the above problems with respect to crisp (exact) parameters. However, in real-life applications such as for biological problems, it is not always possible to get exact values of the associated parameters due to errors in measurements/experiments, observations, and many other errors. Therefore, the associated parameters and variables may be considered uncertain. Here, the uncertainties are considered interval/fuzzy. Therefore, the development of appropriate efficient methods and their use in solving the mentioned uncertain problems are the recent challenge. In view of the above, this book is a new attempt to rigorously present a variety of fuzzy (and interval) time-fractional dynamical models with respect to different biological systems using computationally efficient method. The authors believe this book will be helpful to undergraduates, graduates, researchers, industry, faculties, and others throughout the globe.

This comprehensive book highlights soft computing and geostatistics applications in hydrocarbon exploration and production, combining practical and theoretical aspects. It spans a wide spectrum of applications in the oil industry, crossing many discipline boundaries such as geophysics, geology, petrophysics and reservoir engineering. It is complemented by several tutorial chapters on fuzzy logic, neural networks and genetic algorithms and geostatistics to introduce these concepts to the uninitiated. The application areas include prediction of reservoir properties (porosity, sand thickness, lithology, fluid), seismic processing, seismic and bio stratigraphy, time lapse seismic and core analysis. There is a good balance between introducing soft computing and geostatistics methodologies that are not routinely used in the petroleum industry and various applications areas. The book can be used by many practitioners such as processing geophysicists, seismic interpreters, geologists, reservoir engineers, petrophysicist, geostatistians, asset
mangers and technology application professionals. It will also be of interest to academics to assess the importance of, and contribute to, R&D efforts in relevant areas.

This book presents up-to-date research developments and novel methodologies on semi-Markovian jump systems (S-MJS). It presents solutions to a series of problems with new approaches for the control and filtering of S-MJS, including stability analysis, sliding mode control, dynamic output feedback control, robust filter design, and fault detection. A set of newly developed techniques such as piecewise analysis method, positively invariant set approach, event-triggered method, and cone complementary linearization approaches are presented. Control and Filtering for Semi-Markovian Jump Systems is a comprehensive reference for researcher and practitioners working in control engineering, system sciences and applied mathematics, and is also a useful source of information for senior undergraduates and graduates in these areas. The readers will benefit from some new concepts, new models and new methodologies with practical significance in control engineering and signal processing.

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