Modeling Uncertainty With Fuzzy Logic With Recent Theory And Applications Author Asli Celikyilmaz Oct 2010

Analysis and Design of Intelligent Systems Using Soft Computing TechniquesUncertain Rule-Based Fuzzy SystemsFuzzy ModellingUncertainty Modeling in Knowledge Engineering and Decision Making - Proceedings of the 10th International Flins ConferenceSmart Sensing and ContextData Mining in FinanceTheoretical Advances and Applications of Fuzzy Logic and Soft ComputingModeling Uncertainty with Fuzzy LogicOptimal Models and Methods with Fuzzy QuantitiesIntegrated Uncertainty in Knowledge Modelling and Decision MakingFuzzy Modeling and Fuzzy ControlUncertainty Analysis in Engineering and Sciences: Fuzzy Logic, Statistics, and Neural Network ApproachFuzzy Database ModelingUncertain Rule-based Fuzzy Logic SystemsUncertainty Analysis in Engineering and Sciences: Fuzzy Logic, Statistics, and Neural Network ApproachType-2 Fuzzy Logic: Theory and ApplicationsFoundations of Fuzzy Logic and Soft ComputingUncertainty Modeling in Vibration, Control and Fuzzy Analysis of Structural SystemsType-2 Fuzzy Logic: Theory and ApplicationsFuzzy Logic in Action: Applications in Epidemiology and BeyondAdvanced Concepts in Fuzzy Logic and Systems with Membership UncertaintyFuzzy Logic in GeologyFuzzy Modeling with Spatial Information for Geographic ProblemsComputational Intelligence, Theory and ApplicationsFuzzy Logic for Business, Finance, and ManagementFuzzy Logic in Data ModelingSoft Methods for Integrated Uncertainty ModellingFuzzy Logic and Probability ApplicationsFuzzy Modeling and Control: Theory and ApplicationsModeling and Control of Uncertain Nonlinear Systems with Fuzzy Equations and Z-NumberType-2 Fuzzy Logic in Intelligent Control ApplicationsUncertainty Management with Fuzzy and Rough SetsType-2 Fuzzy LogicAdvanced Fuzzy Logic Technologies in Industrial ApplicationsMechanics and UncertaintyA First Course in Fuzzy Logic, Fuzzy Dynamical Systems, and BiomathematicsFuzzy Logic in Action: Applications in Epidemiology and BeyondFuzzy Rule-Based Modeling with Applications to Geophysical, Biological, and Engineering SystemsNew Trends in Fuzzy LogicFifty Years of Fuzzy Logic and its Applications

Analysis and Design of Intelligent Systems Using Soft Computing Techniques

Fuzzy logic methodology has proven effective in dealing with complex nonlinear systems containing uncertainties that are otherwise difficult to model. Technology based on this methodology is applicable to many real-world problems, especially in the area of consumer products. This book presents the first comprehensive, unified treatment of fuzzy modeling and fuzzy control, providing tools for the control of complex nonlinear systems. Coverage includes model complexity, model precision, and computing time. This is an excellent reference for electrical, computer, chemical, industrial, civil, manufacturing, mechanical and aeronautical engineers, and also useful for graduate courses in electrical engineering, computer engineering, and computer science.

Uncertain Rule-Based Fuzzy Systems

This book presents a comprehensive report on the evolution of Fuzzy Logic since its formulation in Lotfi Zadeh's seminal paper on "fuzzy sets," published in 1965. In addition, it features a stimulating sampling from the broad field of research and development inspired by Zadeh's paper. The chapters, written by pioneers and prominent scholars in the field, show how fuzzy sets have been successfully applied to artificial intelligence, control theory, inference, and reasoning. The book also reports on theoretical issues; features recent applications of Fuzzy Logic in the fields of neural networks, clustering, data mining and software testing; and highlights an important paradigm shift caused by Fuzzy Logic in the area of uncertainty management. Conceived by the editors as an academic celebration of the fifty years' anniversary of the 1965 paper, this work is a must-have for students and researchers willing to get an inspiring picture of the potentialities, limitations, achievements and accomplishments of Fuzzy Logic-based systems.

Fuzzy Modelling

This book constitutes the refereed proceedings of the International Symposium on Integrated Uncertainty in Knowledge Modeling and Decision Making, IUKM 2013, held in Beijing China, in July 2013. The 19 revised full papers were carefully reviewed and selected from 49 submissions and are presented together with keynote and invited talks. The papers provide a wealth of new ideas and report both theoretical and applied research on integrated uncertainty modeling and management.

Uncertainty Modeling in Knowledge Engineering and Decision Making - Proceedings of the 10th International Flins Conference

This book presents in a systematic and comprehensive manner the modeling of uncertainty, vagueness, or imprecision, alias "fuzziness," in just about any field of science and engineering. It delivers a usable methodology for modeling in the absence of real-time feedback. The book includes a short introduction to fuzzy logic containing basic definitions of fuzzy set theory and fuzzy rule systems. It describes methods for the assessment of rule systems, systems with discrete response sets, for modeling time series, for exact physical systems, examines verification and redundancy issues, and investigates rule response functions. Definitions and propositions, some of which have not been published elsewhere, are provided; numerous examples as well as references to more elaborate case studies are also given. Fuzzy rule-based modeling has the potential to revolutionize fields such as hydrology because it can handle uncertainty in modeling problems too complex to be approached by a stochastic analysis. There is also excellent potential for handling large-scale systems such as regionalization or highly non-linear problems such as unsaturated groundwater pollution.

Smart Sensing and Context

This book reports the recent results obtained by Italian researchers in fuzzy logic. It collects some selected papers presented at the 1995 Italian Workshop on Fuzzy Logic (WILF '95), and some invited contributions. The book covers some of the most interesting topics in fuzzy logic: theory, evolutionary computing, and gives an overview of applications in control, image processing, pattern recognition, decisions support systems, and high energy physics. Contents:Structures Related to Fuzzy Logic Approach in Modelling (M Fedrizzi et al)Function Approximation by a Neuro-Fuzzy Method (M Marinaro & D Oricchio)Soft Computing for Control and Identification (R Caponetto et al)Color Classification and Image Enhancement Using Fuzzy Logic (R Attias et al)Application of the Unsupervised Fuzzy Kohonen Clustering Network for Remote Sensed Data Segmentation (P Blonda et al)Rough Fuzzy Sets and Unsupervised Neural Learning: Applications in Computer Vision (A Petrosino)Uncertainty and Approximation in Multimodel-Based Industrial Diagnosis (A Bonarini & P Sassaroli)Environmental Impact Assessment for Industrial Plants: A New Approach with Fuzzy Sets Techniques (R De Vita et al)Fuzzy Adaptive Inference and Medical Decision Support Systems: A Modular Approach for Dialysis Procedure (S Giove et al)High Speed (>50 MFIPS) Digital VLSI CMOS Fuzzy Processors Designed for HEPE Applications (M Masetti et al)and other papers Readership: Scientists and researchers in fuzzy logic, robotics, image processing & computer vision, artificial intelligence, neural networks, systems & knowledge engineering, electrical & electronic engineering, experimental physics, applied mathematics and economics/finance. keywords:

Data Mining in Finance

The world we live in is pervaded with uncertainty and imprecision. Is it likely to rain this afternoon? Should I take an umbrella with me? Will I be able to find parking near the campus? Should I go by bus? Such simple questions are a c- mon occurrence in our daily lives. Less simple examples: What is the probability that the price of oil will rise sharply in the near future? Should I buy Chevron stock? What are the chances that a bailout of GM, Ford and Chrysler will not s- ceed? What will be the consequences? Note that the examples in question involve both uncertainty and imprecision. In the real world, this is the norm rather than exception. There is a deep-seated tradition in science of employing probability theory, and only probability theory, to deal with uncertainty and imprecision. The mon- oly of probability theory came to an end when fuzzy logic made its debut. H- ever, this is by no means a widely accepted view. The belief persists, especially within the probability community, that probability theory is all that is needed to deal with uncertainty. To quote a prominent Bayesian, Professor Dennis Lindley, "The only satisfactory description of uncertainty is probability.

Theoretical Advances and Applications of Fuzzy Logic and Soft Computing

This book describes new methods for building intelligent systems using type-2 fuzzy logic and soft computing (SC) techniques. The authors extend the use of fuzzy logic to a higher order, which is called type-2 fuzzy logic. Combining type-2 fuzzy logic with traditional SC techniques, we can build powerful hybrid intelligent systems that can use the advantages that each technique offers. This book is intended to be a major reference tool and can be used as a textbook.

Modeling Uncertainty with Fuzzy Logic

Fuzzy Modelling: Paradigms and Practice provides an up-to-date and authoritative compendium of fuzzy models, identification algorithms and applications. Chapters in this book have been written by the leading scholars and researchers in their respective subject areas. Several of these chapters include both theoretical material and applications. The editor of this volume has organized and edited the chapters into a coherent and uniform framework. The objective of this book is to provide researchers and practitioners involved in the development of models for complex systems with an understanding of fuzzy modelling, and an appreciation of what makes these models unique. The chapters are organized into three major parts covering relational models, fuzzy neural networks and rule-based models. The material on relational models includes theory along with a large number of implemented case studies, including some on speech recognition, prediction, and ecological systems. The part on fuzzy neural networks covers some fundamentals, such as neurocomputing, fuzzy neurocomputing, etc., identifies the nature of the relationship that exists between fuzzy systems and neural networks, and includes extensive coverage of their architectures. The last part addresses the main design principles governing the development of rule-based models. Fuzzy Modelling: Paradigms and Practice provides a wealth of specific fuzzy modelling paradigms, algorithms and tools used in systems modelling. Also included is a panoply of case studies from various computer, engineering and science disciplines. This should be a primary reference work for researchers and practitioners developing models of complex systems.

Optimal Models and Methods with Fuzzy Quantities

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.

Integrated Uncertainty in Knowledge Modelling and Decision Making

The book contains ten chapters as follows, Prepare Knowledge, Regression and Self-regression Models with Fuzzy Coefficients; Regression and Self-regression Models with Fuzzy Variables, Fuzzy Input/output Model, Fuzzy Cluster Analysis and Fuzzy Recognition, Fuzzy Linear Programming, Fuzzy Geometric Programming, Fuzzy Relative Equation and Its Optimizing, Interval and Fuzzy Differential Equations and Interval and Fuzzy Functional and Their Variation. It can not only be used as teaching materials or reference books for under-graduates in higher education, master graduates and doctor graduates in the courses of applied mathematics, computer science, artificial intelligence, fuzzy information process and automation, operations research, system science and engineering, and the like, but also serves as a reference book for researchers in these fields, particularly, for researchers in soft science.

Fuzzy Modeling and Fuzzy Control

This book describes new methods for building intelligent systems using type-2 fuzzy logic and soft computing (SC) techniques. The authors extend the use of fuzzy logic to a higher order, which is called type-2 fuzzy logic. Combining type-2 fuzzy logic with traditional SC techniques, we can build powerful hybrid intelligent systems that can use the advantages that each technique offers. This book is intended to be a major reference tool and can be used as a textbook.

Uncertainty Analysis in Engineering and Sciences: Fuzzy Logic, Statistics, and Neural Network Approach

The capabilities of modern technology are rapidly increasing, spurred on to a large extent by the tremendous advances in communications and computing. Automated vehicles and global wireless connections are some examples of these advances. In order to take advantage of such enhanced capabilities, our need to model and manipulate our knowledge of the geophysical world, using compatible representations, is also rapidly increasing. In response to this one fundamental issue of great concern in modern geographical research is how to most effectively capture the physical world around us in systems like geographical information systems (GIS). Making this task even more challenging is the fact that uncertainty plays a pervasive role in the representation, analysis and use of geospatial information. The types of uncertainty that appear in geospatial information systems are not the just simple randomness of observation, as in weather data, but are manifested in many other forms including imprecision, incompleteness and granularization. Describing the uncertainty of the boundaries of deserts and mountains clearly require different tools than those provided by probability theory. The multiplicity of modalities of uncertainty appearing in GIS requires a variety of formalisms to model these uncertainties. In light of this it is natural that fuzzy set theory has become a topic of intensive interest in many areas of geographical research and applications This volume, Fuzzy Modeling with Spatial Information for Geographic Problems, provides many stimulating examples of advances in geographical research based on approaches using fuzzy sets and related technologies.

Fuzzy Database Modeling

This is truly an interdisciplinary book for knowledge workers in business, finance, management and socio-economic sciences based on fuzzy logic. It serves as a guide to and techniques for forecasting, decision making and evaluations in an environment involving uncertainty, vagueness, impression and subjectivity. Traditional modeling techniques, contrary to fuzzy logic, do not capture the nature of complex systems especially when humans are involved. Fuzzy logic uses human experience and judgement to facilitate plausible reasoning in order to reach a conclusion. Emphasis is on applications presented in the 27 case studies including Time Forecasting for Project Management, New Product Pricing, and Control of a Parasit-Pest System.

Uncertain Rule-based Fuzzy Logic Systems

Uncertainty has been of concern to engineers, managers and . scientists for many centuries. In management sciences there have existed definitions of uncertainty in a rather narrow sense since the beginning of this century. In engineering and uncertainty has for a long time been considered as in sciences, however, synonymous with random, stochastic, statistic, or probabilistic. Only since the early sixties views on uncertainty have ~ecome more heterogeneous and more tools to model uncertainty than statistics have been proposed by several scientists. The problem of modeling uncertainty adequately has become more important the more complex systems have become, the faster the scientific and engineering world develops,

and the more important, but also more difficult, forecasting of future states of systems have become. The first question one should probably ask is whether uncertainty is a phenomenon, a feature of real world systems, a state of mind or a label for a situation in which a human being wants to make statements about phenomena, i. e. , reality, models, and theories, respectively. One cart also ask whether uncertainty is an objective fact or just a subjective impression which is closely related to individual persons. Whether uncertainty is an objective feature of physical real systems seems to be a philosophical question. This shall not be answered in this volume.

Uncertainty Analysis in Engineering and Sciences: Fuzzy Logic, Statistics, and Neural Network Approach

Fuzzy Logic in Action: Applications in Epidemiology and Beyond, co-authored by Eduardo Massad, Neli Ortega, Laécio Barros, and Cláudio Struchiner is a remarkable achievement. The book brings a major paradigm shift to medical sciences exploring the use of fuzzy sets in epidemiology and medical diagnosis arena. The volume addresses the most significant topics in the broad areas of epidemiology, mathematical modeling and uncertainty, embodying them within the framework of fuzzy set and dynamic systems theory. Written by leading contributors to the area of epidemiology, medical informatics and mathematics, the book combines a very lucid and authoritative exposition of the fundamentals of fuzzy sets with an insightful use of the fundamentals in the area of epidemiology and diagnosis. The content is clearly illustrated by numerous illustrative examples and several real world applications. Based on their profound knowledge of epidemiology and mathematical modeling, and on their keen understanding of the role played by uncertainty and fuzzy sets, the authors provide insights into the connections between biological phenomena and dynamic systems as a mean to predict, diagnose, and prescribe actions. An example is the use of Bellman-Zadeh fuzzy decision making approach to develop a vaccination strategy to manage measles epidemics in São Paulo. The book offers a comprehensive, systematic, fully updated and self-contained treatise of fuzzy sets in epidemiology and diagnosis. Its content covers material of vital interest to students, researchers and practitioners and is suitable both as a textbook and as a reference. The authors present new results of their own in most of the chapters. In doing so, they reflect the trend to view fuzzy sets, probability theory and statistics as an association of complementary and synergetic modeling methodologies.

Type-2 Fuzzy Logic: Theory and Applications

This book generalizes fuzzy logic systems for different types of uncertainty, including - semantic ambiguity resulting from limited perception or lack of knowledge about exact membership functions - lack of attributes or granularity arising from discretization of real data - imprecise description of membership functions - vagueness perceived as fuzzification of conditional attributes. Consequently, the membership uncertainty can be modeled by combining methods of conventional

and type-2 fuzzy logic, rough set theory and possibility theory. In particular, this book provides a number of formulae for implementing the operation extended on fuzzy-valued fuzzy sets and presents some basic structures of generalized uncertain fuzzy logic systems, as well as introduces several of methods to generate fuzzy membership uncertainty. It is desirable as a reference book for under-graduates in higher education, master and doctor graduates in the courses of computer science, computational intelligence, or fuzzy control and classification, and is especially dedicated to researchers and practitioners in industry.

Foundations of Fuzzy Logic and Soft Computing

This book constitutes the refereed proceedings of the 8th Dortmund Fuzzy Days, held in Dortmund, Germany, 2004. The Fuzzy-Days conference has established itself as an international forum for the discussion of new results in the field of Computational Intelligence. All the papers had to undergo a thorough review guaranteeing a solid quality of the programme. The papers are devoted to foundational and practical issues in fuzzy systems, neural networks, evolutionary algorithms, and machine learning and thus cover the whole range of computational intelligence.

Uncertainty Modeling in Vibration, Control and Fuzzy Analysis of Structural Systems

Jerry Mendel explains the complete development of fuzzy logic systems and explores a new methodology to build better and more intelligent systems. Two case studies are carried throughout the book to illustrate and expand on the theories introduced.

Type-2 Fuzzy Logic: Theory and Applications

This year marks the third edition of EuroSSC. It builds on the success of the past editions, held in Enschede, The Netherlands in 2006, and in Kendal, UK in 2007. On behalf of the Organizing Committee, we would like to welcome you to EuroSSC 2008, in Zurich, Switerland. This volume contains the invited papers and technical peer-reviewed papers selected for presentation at the conference. At EuroSSC we aim to explore technologies, algorithms, architectures, p- tocols, and user aspects underlying context-aware smart surroundings, coop- ating intelligent objects, and their applications. Since its inception, EuroSSC has taken a complementary technology-driven and user-driven view to discuss these aspects. It is one of the particularities of EuroSSC, and the 2008 edition made no exception. In addition we emphasized aspects related to quality of c- text and context-aware feedback by actuator systems. This re?ects the growing importance that context processing in uncertain environments and sensor and actuator networks take in ambient intelligence environments. We received 70 paper submissions. They originate from 30 countries of - rope, the Middle East and Africa (66%), Asia (22%),

North America (9%), and South America (3%). These numbers re?ect the European origins of EuroSSC, but also show that EuroSSC is a recognized and attractive platform for parti- pants from all regions of the world.

Fuzzy Logic in Action: Applications in Epidemiology and Beyond

The second edition of this textbook provides a fully updated approach to fuzzy sets and systems that can model uncertainty — i.e., "type-2" fuzzy sets and systems. The author demonstrates how to overcome the limitations of classical fuzzy sets and systems, enabling a wide range of applications from time-series forecasting to knowledge mining to control. In this new edition, a bottom-up approach is presented that begins by introducing classical (type-1) fuzzy sets and systems, and then explains how they can be modified to handle uncertainty. The author covers fuzzy rule-based systems – from type-1 to interval type-2 to general type-2 – in one volume. For hands-on experience, the book provides information on accessing MatLab and Java software to complement the content. The book features a full suite of classroom material.

Advanced Concepts in Fuzzy Logic and Systems with Membership Uncertainty

FLINS, originally an acronym for Fuzzy Logic and Intelligent Technologies in Nuclear Science, is now extended to Computational Intelligence for applied research. The contributions to the 10th of FLINS conference cover state-of-the-art research, development, and technology for computational intelligence systems, both from the foundations and the applications points-of-view.

Fuzzy Logic in Geology

Fuzzy Logic in Action: Applications in Epidemiology and Beyond, co-authored by Eduardo Massad, Neli Ortega, Laécio Barros, and Cláudio Struchiner is a remarkable achievement. The book brings a major paradigm shift to medical sciences exploring the use of fuzzy sets in epidemiology and medical diagnosis arena. The volume addresses the most significant topics in the broad areas of epidemiology, mathematical modeling and uncertainty, embodying them within the framework of fuzzy set and dynamic systems theory. Written by leading contributors to the area of epidemiology, medical informatics and mathematics, the book combines a very lucid and authoritative exposition of the fundamentals of fuzzy sets with an insightful use of the fundamentals in the area of epidemiology and diagnosis. The content is clearly illustrated by numerous illustrative examples and several real world applications. Based on their profound knowledge of epidemiology and mathematical modeling, and on their keen understanding of the role played by uncertainty and fuzzy sets, the authors provide insights into the connections between biological phenomena and dynamic systems as a mean to predict, diagnose, and prescribe actions. An example is the use of Bellman-Zadeh fuzzy decision making approach to develop a vaccination

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Fuzzy Modeling with Spatial Information for Geographic Problems

Science is a quest for certainty, but lack of certainty is the driving force behind all of its endeavors. This book, specifically, examines the uncertainty of technological and industrial science. Uncertainty and Mechanics studies the concepts of mechanical design in an uncertain setting and explains engineering techniques for inventing cost-effective products. Though it references practical applications, this is a book about ideas and potential advances in mechanical science.

Computational Intelligence, Theory and Applications

We describe in this book, hybrid intelligent systems based mainly on type-2 fuzzy logic for intelligent control. Hybrid intelligent systems combine several intelligent computing paradigms, including fuzzy logic, and bio-inspired optimization algorithms, which can be used to produce powerful automatic control systems. The book is organized in three main parts, which contain a group of chapters around a similar subject. The first part consists of chapters with the main theme of theory and design algorithms, which are basically chapters that propose new models and concepts, which can be the basis for achieving intelligent control with interval type-2 fuzzy logic. The second part of the book is comprised of chapters with the main theme of evolutionary optimization of type-2 fuzzy systems in intelligent control with the aim of designing optimal type-2 fuzzy controllers for complex control problems in diverse areas of application, including mobile robotics, aircraft dynamics systems and hardware implementations. The third part of the book is formed with chapters dealing with the theme of bio-inspired optimization of type-2 fuzzy systems in intelligent control, which includes the application of particle swarm intelligence and ant colony optimization algorithms for obtaining optimal type-2 fuzzy controllers.

Fuzzy Logic for Business, Finance, and Management

This book offers a timely overview of fuzzy and rough set theories and methods. Based on selected contributions presented at the International Symposium on Fuzzy and Rough Sets, ISFUROS 2017, held in Varadero, Cuba, on October 24-26, 2017, the book also covers related approaches, such as hybrid rough-fuzzy sets and hybrid fuzzy-rough sets and granular computing, as well as a number of applications, from big data analytics, to business intelligence, security, robotics,

logistics, wireless sensor networks and many more. It is intended as a source of inspiration for PhD students and researchers in the field, fostering not only new ideas but also collaboration between young researchers and institutions and established ones.

Fuzzy Logic in Data Modeling

Some recent fuzzy database modeling advances for the non-traditional applications are introduced in this book. The focus is on database models for modeling complex information and uncertainty at the conceptual, logical, physical design levels and from integrity constraints defined on the fuzzy relations. The database models addressed here are; the conceptual data models, including the ExIFO and ExIFO2 data models, the logical database models, including the extended NF2 database model, fuzzy object-oriented database model, and the fuzzy deductive object-oriented database model. Integrity constraints are defined on the fuzzy relations are also addressed. A continuing reason for the limited adoption of fuzzy database systems has been performance. There have been few efforts at defining physical structures that accomodate fuzzy information. A new access structure and data organization for fuzzy information is introduced in this book.

Soft Methods for Integrated Uncertainty Modelling

The idea of soft computing emerged in the early 1990s from the fuzzy systems c- munity, and refers to an understanding that the uncertainty, imprecision and ig- rance present in a problem should be explicitly represented and possibly even - ploited rather than either eliminated or ignored in computations. For instance, Zadeh de?ned 'Soft Computing' as follows: Soft computing differs from conventional (hard) computing in that, unlike hard computing, it is tolerant of imprecision, uncertainty and partial truth. In effect, the role model for soft computing is the human mind. Recently soft computing has, to some extent, become synonymous with a hybrid approach combining AI techniques including fuzzy systems, neural networks, and biologically inspired methods such as genetic algorithms. Here, however, we adopt a more straightforward de?nition consistent with the original concept. Hence, soft methods are understood as those uncertainty formalisms not part of mainstream s- tistics and probability theory which have typically been developed within the AI and decisionanalysiscommunity.Thesearemathematicallysounduncertaintymodelling methodologies which are complementary to conventional statistics and probability theory.

Fuzzy Logic and Probability Applications

This book provides an essential introduction to the field of dynamical models. Starting from classical theories such as set theory and probability, it allows readers to draw near to the fuzzy case. On one hand, the book equips readers with a

fundamental understanding of the theoretical underpinnings of fuzzy sets and fuzzy dynamical systems. On the other, it demonstrates how these theories are used to solve modeling problems in biomathematics, and presents existing derivatives and integrals applied to the context of fuzzy functions. Each of the major topics is accompanied by examples, worked-out exercises, and exercises to be completed. Moreover, many applications to real problems are presented. The book has been developed on the basis of the authors' lectures to university students and is accordingly primarily intended as a textbook for both upper-level undergraduates and graduates in applied mathematics, statistics, and engineering. It also offers a valuable resource for practitioners such as mathematical consultants and modelers, and for researchers alike, as it may provide both groups with new ideas and inspirations for projects in the fields of fuzzy logic and biomathematics.

Fuzzy Modeling and Control: Theory and Applications

Data Mining in Finance presents a comprehensive overview of major algorithmic approaches to predictive data mining, including statistical, neural networks, ruled-based, decision-tree, and fuzzy-logic methods, and then examines the suitability of these approaches to financial data mining. The book focuses specifically on relational data mining (RDM), which is a learning method able to learn more expressive rules than other symbolic approaches. RDM is thus better suited for financial mining, because it is able to make greater use of underlying domain knowledge. Relational data mining also has a better ability to explain the discovered rules - an ability critical for avoiding spurious patterns which inevitably arise when the number of variables examined is very large. The earlier algorithms for relational data mining, also known as inductive logic programming (ILP), suffer from a relative computational inefficiency and have rather limited tools for processing numerical data. Data Mining in Finance introduces a new approach, combining relational data mining with the analysis of statistical significance of discovered rules. This reduces the search space and speeds up the algorithms. The book also presents interactive and fuzzy-logic tools for `mining' the knowledge from the experts, further reducing the search space. Data Mining in Finance contains a number of practical examples of forecasting S&P 500, exchange rates, stock directions, and rating stocks for portfolio, allowing interested readers to start building their own models. This book is an excellent reference for researchers and professionals in the fields of artificial intelligence, machine learning, data mining, knowledge discovery, and applied mathematics.

Modeling and Control of Uncertain Nonlinear Systems with Fuzzy Equations and Z-Number

Uncertainty has been of concern to engineers, managers and . scientists for many centuries. In management sciences there have existed definitions of uncertainty in a rather narrow sense since the beginning of this century. In engineering and uncertainty has for a long time been considered as in sciences, however, synonymous with random, stochastic, statistic, or probabilistic. Only since the early sixties views on uncertainty have ~ecome more heterogeneous and more tools to model

uncertainty than statistics have been proposed by several scientists. The problem of modeling uncertainty adequately has become more important the more complex systems have become, the faster the scientific and engineering world develops, and the more important, but also more difficult, forecasting of future states of systems have become. The first question one should probably ask is whether uncertainty is a phenomenon, a feature of real world systems, a state of mind or a label for a situation in which a human being wants to make statements about phenomena, i. e. , reality, models, and theories, respectively. One cart also ask whether uncertainty is an objective fact or just a subjective impression which is closely related to individual persons. Whether uncertainty is an objective feature of physical real systems seems to be a philosophical question. This shall not be answered in this volume.

Type-2 Fuzzy Logic in Intelligent Control Applications

This book focuses on a particular domain of Type-2 Fuzzy Logic, related to process modeling and control applications. It deepens readers'understanding of Type-2 Fuzzy Logic with regard to the following three topics: using simpler methods to train a Type-2 Takagi-Sugeno Fuzzy Model; using the principles of Type-2 Fuzzy Logic to reduce the influence of modeling uncertainties on a locally linear n-step ahead predictor; and developing model-based control algorithms according to the Generalized Predictive Control principles using Type-2 Fuzzy Sets. Throughout the book, theory is always complemented with practical applications and readers are invited to take their learning process one step farther and implement their own applications using the algorithms' source codes (provided). As such, the book offers avaluable referenceguide for allengineers and researchers in the field ofcomputer science who are interested in intelligent systems, rule-based systems and modeling uncertainty.

Uncertainty Management with Fuzzy and Rough Sets

This book gives an overview of the current state of uncertainty modeling in vibration, control, and fuzzy analysis of structural and mechanical systems. It is a coherent compendium written by leading experts and offers the reader a sampling of exciting research areas in several fast-growing branches in this field. Uncertainty modeling and analysis are becoming an integral part of system definition and modeling in many fields. The book consists of ten chapters that report the work of researchers, scientists and engineers on theoretical developments and diversified applications in engineering systems. They deal with modeling for vibration, control, and fuzzy analysis of structural and mechanical systems under uncertain conditions. The book designed for readers who are familiar with the fundamentals and wish to study a particular topic or use the book as an authoritative reference. It gives readers a sophisticated toolbox for tackling modeling problems in mechanical and structural systems in real-world situations. The book is part of a series on Stability, Vibration and Control of Structures, and provides vital information in these areas.

Type-2 Fuzzy Logic

also in: THE KLUWER INTERNATIONAL SERIES ON ASIAN STUDIES IN COMPUTER AND INFORMATION SCIENCE, Volume 2

Advanced Fuzzy Logic Technologies in Industrial Applications

What is fuzzy logic?--a system of concepts and methods for exploring modes of reasoning that are approximate rather than exact. While the engineering community has appreciated the advances in understanding using fuzzy logic for quite some time, fuzzy logic's impact in non-engineering disciplines is only now being recognized. The authors of Fuzzy Logic in Geology attend to this growing interest in the subject and introduce the use of fuzzy set theory in a style geoscientists can understand. This is followed by individual chapters on topics relevant to earth scientists: sediment modeling, fracture detection, reservoir characterization, clustering in geophysical data analysis, ground water movement, and time series analysis. George Klir is the Distinguished Professor of Systems Science and Director of the Center for Intelligent Systems, Fellow of the IEEE and IFSA, editor of nine volumes, editorial board member of 18 journals, and author or co-author of 16 books Foreword by the inventor of fuzzy logic-- Professor Lotfi Zadeh

Mechanics and Uncertainty

This book introduces a dynamic, on-line fuzzy inference system. In this system membership functions and control rules are not determined until the system is applied and each output of its lookup table is calculated based on current inputs. The book describes the real-world uses of new fuzzy techniques to simplify readers' tuning processes and enhance the performance of their control systems. It further contains application examples.

A First Course in Fuzzy Logic, Fuzzy Dynamical Systems, and Biomathematics

This book comprises a selection of papers on theoretical advances and applications of fuzzy logic and soft computing from the IFSA 2007 World Congress, held in Cancun, Mexico, June 2007. These papers constitute an important contribution to the theory and applications of fuzzy logic and soft computing methodologies.

Fuzzy Logic in Action: Applications in Epidemiology and Beyond

Annotation 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. These papers were selected from over 400 submissions and constitute an

important contribution to the theory and applications of fuzzy logic and soft computing methodologies. Soft Computing consists of several computing paradigms, including fuzzy logic, neural networks, genetic algorithms, and other techniques, which can be used to produce powerful intelligent systems for solving real-world problems. This book is intended to be a major reference for scientists and engineers interested in applying new computational and mathematical tools to achieve intelligent solution to complex problems. We consider that this book can also be used to get novel ideas for new lines of research, or to continue the lines of research proposed by the authors of the papers contained in the book. The 80 papers presented were carefully reviewed and selected form more than 400 submissions. The papers are organized in topical sections on relation between interval and fuzzy techniques, intuitionistic fuzzy sets and their applications, 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, perception based data mining and decision making, joint model-based and data-based learning: the fuzzy logic approach, fuzzy possibilistic optimization, fuzzy trees, fuzzy logic theory, type-2 fuzzy logic, fuzzy logic applications, neural networks and control, as well as intelligent agents and knowledge ant colony.

Fuzzy Rule-Based Modeling with Applications to Geophysical, Biological, and Engineering Systems

Much work on fuzzy control, covering research, development and applications, has been developed in Europe since the 90's. Nevertheless, the existing books in the field are compilations of articles without interconnection or logical structure or they express the personal point of view of the author. This book compiles the developments of researchers with demonstrated experience in the field of fuzzy control following a logic structure and a unified the style. The first chapters of the book are dedicated to the introduction of the main fuzzy logic techniques, where the following chapters focus on concrete applications. This book is supported by the EUSFLAT and CEA-IFAC societies, which include a large number of researchers in the field of fuzzy logic and control. The central topic of the book, Fuzzy Control, is one of the main research and development lines covered by these associations.

New Trends in Fuzzy Logic

This book comprises a selection of papers on new methods for analysis and design of hybrid intelligent systems using soft computing techniques from the IFSA 2007 World Congress, held in Cancun, Mexico, June 2007.

Fifty Years of Fuzzy Logic and its Applications

Probabilists and fuzzy enthusiasts tend to disagree about which philosophy is best and they rarely work together. As a

result, textbooks usually suggest only one of these methods for problem solving, but not both. This book is an exception. The authors, investigators from both fields, have combined their talents to provide a practical guide showing that both fuzzy logic and probability have their place in the world of problem solving. They work together with mutual benefit for both disciplines, providing scientists and engineers with examples of and insight into the best tool for solving problems involving uncertainty. Fuzzy Logic and Probability Applications: Bridging the Gap makes an honest effort to show both the shortcomings and benefits of each technique, and even demonstrates useful combinations of the two. It provides clear descriptions of both fuzzy logic and probability, as well as the theoretical background, examples, and applications from both fields, making it a useful hands-on workbook for members of both camps. It contains enough theory and references to fundamental work to provide firm ground for both engineers and scientists at the undergraduate level and above. Readers should have a familiarity with mathematics through calculus.

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