Fuzzy Modeling And Genetic Algorithms For Data Mining And Exploration The Morgan Kaufmann Series In Data Management Systems

The analysis and control of complex systems have been the main motivation for the emergence of fuzzy set theory since its inception. It is also a major research field where many applications, especially industrial ones, have made fuzzy logic famous. This unique handbook is devoted to an extensive, organized, and up-to-date presentation of fuzzy systems engineering methods. The book includes detailed material and extensive bibliographies, written by leading experts in the field, on topics such as: Use of fuzzy logic in various control systems. Fuzzy rule-based modeling and its universal approximation properties. Learning and tuning techniques for fuzzy models, using neural networks and genetic algorithms. Fuzzy control methods, including issues such as stability analysis and design techniques, as well as the relationship with traditional linear control. Fuzzy sets relation to the study of chaotic systems, and the fuzzy extension of set-valued approaches to systems modeling through the use of differential inclusions. Fuzzy Systems: Modeling and Control is part of The Handbooks of Fuzzy Sets Series. The series provides a complete picture of contemporary fuzzy set theory and its applications. This volume is a key reference for systems engineers and scientists seeking a guide to the vast amount of literature in fuzzy logic modeling and control.
The mathematics employed by genetic algorithms (GAs)are among the most exciting discoveries of the last few decades. But what exactly is a genetic algorithm? A genetic algorithm is a problem-solving method that uses genetics as its model of problem solving. It applies the rules of reproduction, gene crossover, and mutation to pseudo-organism
This book provides comprehensive introduction to a consortium of technologies underlying soft computing, an evolving branch of computational intelligence. The constituent technologies discussed comprise neural networks, fuzzy logic, genetic algorithms, and a number of hybrid systems which include classes such as neuro-fuzzy, fuzzy-genetic, and neuro-genetic systems. The hybridization of the technologies is demonstrated on architectures such as Fuzzy-Back-propagation Networks (NN-FL), Simplified Fuzzy ARTMAP (NN-FL), and Fuzzy Associative Memories. The book also gives an exhaustive discussion of FL-GA hybridization. Every architecture has been discussed in detail through illustrative examples and applications. The algorithms have been presented in pseudo-code with a step-by-step illustration of the same in problems. The applications, demonstrative of the potential of the architectures, have been chosen from diverse disciplines of science and engineering. This book with a wealth of information that is clearly presented and illustrated by many examples and applications is designed for use as a text for courses in soft computing at both the senior undergraduate and first-year post-graduate engineering levels. It should also be of interest to researchers and technologists desirous of applying soft computing technologies to their respective fields of work.
While several books are available today that address the mathematical and philosophical foundations of fuzzy logic, none, unfortunately, provides the practicing knowledge engineer, system analyst, and project manager with specific, practical information about fuzzy system modeling. Those few books that include applications and case studies concentrate almost exclusively on engineering problems: pendulum balancing, truck backeruppers, cement kilns, antilock braking systems, image pattern recognition, and digital signal processing. Yet the application of fuzzy logic to engineering problems represents only a fraction of its real potential. As a method of encoding and using human knowledge in a form that is very close to the way experts think about difficult, complex problems, fuzzy systems provide the facilities necessary to break through the computational bottlenecks associated with traditional decision support and expert systems. Additionally, fuzzy systems provide a rich and robust method of building systems that include multiple conflicting, cooperating, and collaborating experts (a capability that generally eludes not only symbolic expert system users but analysts who have turned to such related technologies as neural networks and genetic algorithms). Yet the application of fuzzy logic in the areas of decision support, medical systems, database analysis and mining has been largely ignored by both the commercial vendors of decision support products and the knowledge engineers who use them.
Cost Optimization of Structures
Fuzzy Partial Differential Equations and Relational Equations

Control, Optimization, and Smart Structures
Coevolutionary Fuzzy Modeling
SYNTHESIS AND APPLICATIONS (WITH CD)

While the weight of a structure constitutes a significant part of the cost, a minimum weight design is not necessarily the minimum cost design. Little attention in structural optimization has been paid to the cost optimization problem, particularly of realistic three-dimensional structures. Cost optimization is becoming a priority in all civil engineering projects, and the concept of Life-Cycle Costing is penetrating design, manufacturing and construction organizations. In this groundbreaking book the authors present novel computational models for cost optimization of large scale, realistic structures, subjected to the actual constraints of commonly used design codes. As the first book on the subject this book: Contains detailed step-by-step algorithms Focuses on novel computing techniques such as genetic algorithms, fuzzy logic, and parallel computing Covers both Allowable Stress Design (ASD) and Load and Resistance Factor Design (LRFD) codes Includes realistic design examples covering large-scale, high-rise building structures Presents computational models that enable substantial cost savings in the design of structures Fully automated structural design and cost optimization is where large-scale design technology is heading, thus Cost Optimization of Structures: Fuzzy Logic, Genetic Algorithms, and Parallel Computing will be of great interest to civil and structural engineers, mechanical engineers, structural design software developers, and architectural engineers involved in the design of structures and life-cycle cost optimisation. It is also a pioneering text for graduate students and researchers working in building design and structural optimization.
Artificial neural networks can mimic the biological information-processing mechanism in - a very limited sense. Fuzzy logic provides a basis for representing uncertain and imprecise knowledge and forms a basis for human reasoning. Neural networks display genuine promise in solving problems, but a definitive theoretical basis does not yet exist for their design. Fusion of Neural Networks, Fuzzy Systems and Genetic Algorithms integrates neural net, fuzzy system, and evolutionary computing in system design that enables its readers to handle complexity - offsetting the demerits of one paradigm by the merits of another. This book presents specific projects where fusion techniques have been applied. The chapters start with the design of a new fuzzy-neural controller. Remaining chapters discuss the application of expert systems, neural networks, fuzzy control, and evolutionary computing techniques in modern engineering systems. These specific applications include: direct frequency converters electro-hydraulic systems motor control toaster control speech recognition vehicle routing fault diagnosis Asynchronous Transfer Mode (ATM) communications networks telephones for hard-of-hearing people control of gas turbine aero-engines telecommunications systems design Fusion of Neural Networks, Fuzzy Systems and Genetic Algorithms covers the spectrum of applications - comprehensively demonstrating the advantages of fusion techniques in industrial applications.
The 2008 IEEE World Congress on Computational Intelligence (WCCI 2008), held during June 1-6, 2008 in Hong Kong, China, marked an important milestone in advancing the paradigms of the new fields of computational intelligence. As the fifth event in the series that has spanned the globe (Orlando-1994, Anchorage-1998, Honolulu-2002, Vancouver-2006), the congress offered renewed and refreshing focus on the progress in nature-inspired and linguistically motivated computation. Most of the congress's program featured regular and special technical sessions that provided participants with new insights into the most recent developments in the field. As a tradition, in addition to the parallel technical sessions, WCCI holds a series of plenary and invited lectures which are not included in the congress proceedings. As its predecessors, at WCCI 2008, 20 expert speakers shared their expertise on broader, if not panoramic, topics spanning a diverse spectrum of computational intelligence in the areas of neurocomputing, fuzzy systems, evolutionary computation, and adjacent areas. Thanks to their time and expertise, we endeavored to offer this volume to attendees directly at the congress and the general public afterwards.
Fuzzy Modeling and Genetic Algorithms for Data Mining and Exploration is a handbook for analysts, engineers, and managers involved in developing data mining models in business and government. As you'll discover, fuzzy systems are extraordinarily valuable tools for representing and manipulating all kinds of data, and genetic algorithms and evolutionary programming techniques drawn from biology provide the most effective means for designing and tuning these systems. You don't need a background in fuzzy modeling or genetic algorithms to benefit, for this book provides it, along with detailed instruction in methods that you can immediately put to work in your own projects. The author provides many diverse examples and also an extended example in which evolutionary strategies are used to create a complex scheduling system. Written to provide analysts, engineers, and managers with the background and specific instruction needed to develop and implement more effective data mining systems Helps you to understand the trade-offs implicit in various models and model architectures Provides extensive coverage of fuzzy SQL querying, fuzzy clustering, and fuzzy rule induction Lays out a roadmap for exploring data, selecting model system measures, organizing adaptive feedback loops, selecting a model configuration, implementing a working model, and validating the final model In an extended example, applies evolutionary programming techniques to solve a complicated scheduling problem Presents examples in C, C++, Java, and easy-to-understand pseudo-code Extensive online component, including sample code and a complete data mining workbench
New Frontiers, Volume II
Fuzzy Logic, Neural Networks, and Genetic Algorithms
Evolutionary Tuning and Learning of Fuzzy Knowledge Bases
Fuzzy Modeling Using Cooperative Genetic Algorithm
Fusion of Neural Networks, Fuzzy Systems and Genetic Algorithms
Methods and Applications

Intelligent Control considers non-traditional modelling and control approaches to nonlinear systems. Fuzzy logic, neural networks and evolutionary computing techniques are the main tools used. The book presents a modular switching fuzzy logic controller where a PD-type fuzzy controller is executed first followed by a PI-type fuzzy controller thus improving the performance of the controller compared with a PID-type fuzzy controller. The advantage of the switching-type fuzzy controller is that it uses one rule-base thus minimises the rule-base during execution. A single rule-base is developed by merging the membership functions for change of error of the PD-type controller and sum of error of the PI-type controller. Membership functions are then optimized using evolutionary algorithms. Since the two fuzzy controllers were executed in series, necessary further tuning of the differential and integral scaling factors of the controller is then performed. Neural-network-based tuning for the scaling parameters of the fuzzy controller is then described and finally an evolutionary algorithm is applied to the neurally-tuned-fuzzy controller in which the sigmoidal function shape of the neural network is determined. The important issue of stability is addressed and the text demonstrates empirically that the developed controller was stable within the operating range. The text concludes with ideas for future research to show the reader the potential for further study in this area. Intelligent Control will be of interest to researchers from engineering and computer science backgrounds working in the intelligent and adaptive control.
In the last ten years, a true explosion of investigations into fuzzy modeling and its applications in control, diagnostics, decision making, optimization, pattern recognition, robotics, etc. has been observed. The attraction of fuzzy modeling results from its intelligibility and the high effectiveness of the models obtained. Owing to this the modeling can be applied for the solution of problems which could not be solved till now with any known conventional methods. The book provides the reader with an advanced introduction to the problems of fuzzy modeling and to one of its most important applications: fuzzy control. It is based on the latest and most significant knowledge of the subject and can be used not only by control specialists but also by specialists working in any field requiring plant modeling, process modeling, and systems modeling, e.g. economics, business, medicine, agriculture,and meteorology.
Fuzzy modeling has become one of the most productive and successful results of fuzzy logic. Among others, it has been applied to knowledge discovery, automatic classification, long-term prediction, or medical and engineering analysis. The research developed in the topic during the last two decades has been mainly focused on exploiting the fuzzy model flexibility to obtain the highest accuracy. This approach usually sets aside the interpretability of the obtained models. However, we should remember the initial philosophy of fuzzy sets theory directed to serve the bridge between the human understanding and the machine processing. In this challenge, the ability of fuzzy models to express the behavior of the real system in a comprehensible manner acquires a great importance. This book collects the works of a group of experts in the field that advocate the interpretability improvements as a mechanism to obtain well balanced fuzzy models.
This book focuses on the fields of hybrid intelligent systems based on fuzzy systems, neural networks, bio-inspired algorithms and time series. This book describes the construction of ensembles of Interval Type-2 Fuzzy Neural Networks models and the optimization of their fuzzy integrators with bio-inspired algorithms for time series prediction. Interval type-2 and type-1 fuzzy systems are used to integrate the outputs of the Ensemble of Interval Type-2 Fuzzy Neural Network models. Genetic Algorithms and Particle Swarm Optimization are the Bio-Inspired algorithms used for the optimization of the fuzzy response integrators. The Mackey-Glass, Mexican Stock Exchange, Dow Jones and NASDAQ time series are used to test of performance of the proposed method. Prediction errors are evaluated by the following metrics: Mean Absolute Error, Mean Square Error, Root Mean Square Error, Mean Percentage Error and Mean Absolute Percentage Error. The proposed prediction model outperforms state of the art methods in predicting the particular time series considered in this work.
Intelligent Polishing Using Fuzzy Logic and Genetic Algorithm
Modeling and Control
Statistical and Computational Techniques in Manufacturing
High-Performance Bridges and Buildings of the Future
Ensembles of Type 2 Fuzzy Neural Models and Their Optimization with Bio-Inspired Algorithms for Time Series Prediction
Applications in Industrial Process Modeling and Control

The purpose of this book is to present a methodology for designing and tuning fuzzy expert systems in order to identify nonlinear objects; that is, to build input-output models using expert and experimental information. The results of these identifications are used for direct and inverse fuzzy evidence in forecasting and diagnosis problem solving. The book is organised as follows: Chapter 1 presents the basic knowledge about fuzzy sets, genetic algorithms and neural nets necessary for a clear understanding of the rest of this book. Chapter 2 analyzes direct fuzzy inference based on fuzzy if-then rules. Chapter 3 is devoted to the tuning of fuzzy rules for direct inference using genetic algorithms and neural nets. Chapter 4 presents models and algorithms for extracting fuzzy rules from experimental data. Chapter 5 describes a method for solving fuzzy logic equations necessary for the inverse fuzzy inference in diagnostic systems. Chapters 6 and 7 are devoted to inverse fuzzy inference based on fuzzy relations and fuzzy rules. Chapter 8 presents a method for extracting fuzzy relations from data. All the algorithms presented in Chapters 2-8 are validated by computer experiments and illustrated by solving medical and technical forecasting and diagnosis problems. Finally, Chapter 9 includes applications of the proposed methodology in dynamic and inventory control systems, prediction of results of football games, decision making in road accident investigations, project management and reliability analysis.
Intelligent Hybrid Systems: Fuzzy Logic, Neural Networks, and Genetic Algorithms is an organized edited collection of contributed chapters covering basic principles, methodologies, and applications of fuzzy systems, neural networks and genetic algorithms. All chapters are original contributions by leading researchers written exclusively for this volume. This book reviews important concepts and models, and focuses on specific methodologies common to fuzzy systems, neural networks and evolutionary computation. The emphasis is on development of cooperative models of hybrid systems. Included are applications related to intelligent data analysis, process analysis, intelligent adaptive information systems, systems identification, nonlinear systems, power and water system design, and many others. Intelligent Hybrid Systems: Fuzzy Logic, Neural Networks, and Genetic Algorithms provides researchers and engineers with up-to-date coverage of new results, methodologies and applications for building intelligent systems capable of solving large-scale problems.
Fuzzy Modeling and Genetic Algorithms for Data Mining and Exploration is a handbook for analysts, engineers, and managers involved in developing data mining models in business and government. As you'll discover, fuzzy systems are extraordinarily valuable tools for representing and manipulating all kinds of data, and genetic algorithms and evolutionary programming techniques drawn from biology provide the most effective means for designing and tuning these systems. You don't need a background in fuzzy modeling or genetic algorithms to benefit, for this book provides it, along with detailed instruction in methods that you can immediately put to work in your own projects. The author provides many diverse examples and also an extended example in which evolutionary strategies are used to create a complex scheduling system. Written to provide analysts, engineers, and managers with the background and specific instruction needed to develop and implement more effective data mining systems Helps you to understand the trade-offs implicit in various models and model architectures Provides extensive coverage of fuzzy SQL querying, fuzzy clustering, and fuzzy rule induction Lays out a roadmap for exploring data, selecting model system measures, organizing adaptive feedback loops, selecting a model configuration, implementing a working model, and validating the final model In an extended example, applies evolutionary programming techniques to solve a complicated scheduling problem Presents examples in C, C++, Java, and easy-to-understand pseudo-code Extensive online component, including sample code and a complete data mining workbench
Advances in Computational Intelligence and Learning: Methods and Applications presents new developments and applications in the area of Computational Intelligence, which essentially describes methods and approaches that mimic biologically intelligent behavior in order to solve problems that have been difficult to solve by classical mathematics. Generally Fuzzy Technology, Artificial Neural Nets and Evolutionary Computing are considered to be such approaches. The Editors have assembled new contributions in the areas of fuzzy sets, neural sets and machine learning, as well as combinations of them (so called hybrid methods) in the first part of the book. The second part of the book is dedicated to applications in the areas that are considered to be most relevant to Computational Intelligence.
A Fuzzy Cooperative Genetic Algorithm for Fuzzy Modeling
Modeling of Metabolic Systems Using Fuzzy Logic and Supervisory Simplex Genetic Algorithm
Intelligent Control
Fuzzy Modeling and Genetic Algorithms for Data Mining and Exploration
Fuzzy Evidence in Identification, Forecasting and Diagnosis
A Hybrid Approach Based on Fuzzy Logic, Neural Networks and Genetic Algorithms

This book focuses on the implementation, evaluation and application of DNA/RNA-based genetic algorithms in connection with neural network modeling, fuzzy control, the Q-learning algorithm and CNN deep learning classifier. It presents several DNA/RNA-based genetic algorithms and their modifications, which are tested using benchmarks, as well as detailed information on the implementation steps and program code. In addition to single-objective optimization, here genetic algorithms are also used to solve multi-objective optimization for neural network modeling, fuzzy control, model predictive control and PID control. In closing, new topics such as Q-learning and CNN are introduced. The book offers a valuable reference guide for researchers and designers in system modeling and control, and for senior undergraduate and graduate students at colleges and universities.
In recent years, interest in developing statistical and computational techniques for applied manufacturing engineering has been increased. Today, due to the great complexity of manufacturing engineering and the high number of parameters used, conventional approaches are no longer sufficient. Therefore, in manufacturing, statistical and computational techniques have achieved several applications, namely, modelling and simulation manufacturing processes, optimization manufacturing parameters, monitoring and control, computer-aided process planning, etc. The present book aims to provide recent information on statistical and computational techniques applied in manufacturing engineering. The content is suitable for final undergraduate engineering courses or as a subject on manufacturing at the postgraduate level. This book serves as a useful reference for academics, statistical and computational science researchers, mechanical, manufacturing and industrial engineers, and professionals in industries related to manufacturing engineering.
This dissertation, "Modeling, Analysis and Control Design for the UPFC With Fuzzy Theory and Genetic Algorithm Application" by Tsz-kin, Mok, □□□, was obtained from The University of Hong Kong (Pokfulam, Hong Kong) and is being sold pursuant to Creative Commons: Attribution 3.0 Hong Kong License. The content of this dissertation has not been altered in any way. We have altered the formatting in order to facilitate the ease of printing and reading of the dissertation. All rights not granted by the above license are retained by the author. DOI: 10.5353/th_b3122496 Subjects: Flexible AC transmission systems Fuzzy logic Genetic algorithms
Providing a thorough introduction to the field of soft computing techniques, Intelligent Systems: Modeling, Optimization, and Control covers every major technique in artificial intelligence in a clear and practical style. This book highlights current research and applications, addresses issues encountered in the development of applied systems, and describes a wide range of intelligent systems techniques, including neural networks, fuzzy logic, evolutionary strategy, and genetic algorithms. The book demonstrates concepts through simulation examples and practical experimental results. Case studies are also presented from each field to facilitate understanding.
Fuzzy Systems
Reservoir Characterization and Modeling
Fuzzy Decision Making in Modeling and Control
Fuzzy Model Identification
Genetic Fuzzy Systems
Soft Computing Perspectives

Building on fuzzy logic and evolutionary computing, this book introduces fuzzy cooperative coevolution as a novel approach to systems design, conductive to explaining human decision process. Fuzzy cooperative coevolution is a methodology for constructing systems able to accurately predict the outcome of making process, while providing an understandable explanation of the underlying reasoning. The central contribution of this work is the use of an advanced evolutionary technique, cooperative coevolution, for dealing with the simultaneous design of connective and operational parameters. Cooperative coevolu overcomes several limitations exhibited by other standard evolutionary approaches. The applicability of fuzzy cooperative coevolution is validated by modeling the decision processes of three real-world problems, an iris data benchmark problem and two problems from breast cancer diagnosis.
This dissertation, "Intelligent Polishing Using Fuzzy Logic and Genetic Algorithm" by Yiu-ming, Tsang, ???, was obtained from The University of Hong Kong (Pokfulam, Hong Kong) and is being sold pursuant to Creative Commons: Attribution 3.0 Hong Kong License. The content of this dissertation has not bee altered in any way. We have altered the formatting in order to facilitate the ease of printing and reading of the dissertation. All rights not granted by the above license are retained by the author. Abstract: Abstract of the thesis entitled Intelligent polishing using fuzzy logic and genetic algorithm Submitted by TSA MING For the degree of Master of Philosophy At the University of Hong Kong In December 2006 Abstract Polishing is widely applied to different products. The quality of surface finish is very important as it affects not only surface appearance, but also product functionality. The mechanism of the polishing proce thoroughly understood. It is difficult for polish workers to adjust parameter settings to control the quality of surface finish, and also to determine the parameter settings for the polishing process by the mathematical approach. Fuzzy logic has been applied in controlling processes with unknown mechanism and a model can be optimized by genetic algorithms. In this thesis, an intelligent system using both fuzzy logic and genetic algorithms is proposed to generate parameter settings automatically with given inputs. i i The working principle of the intelligent system is that a parameter setting can be generated with the use knowledge base generated by the knowledge base module. The intelligent system is divided into two modules: the design of a knowledge base module and a parameter setting generation module. The knowledge base module consists of fuzzy rules and membership functions, which are derived from experime optimized by genetic algorithm. In the parameter setting generation module, parameter settings are generated with the use of the knowledge base. The proposed design is implemented. The implementation is divided into 3 parts: (a) collection of experimental data for the generation of the knowledge base; (b) t development of the knowledge base module; and (c) development of the parameter setting generation module. For the collection of experimental data, an experiment is conducted based on defined materials, and equipment and experimental procedures. For the development of the knowledge base module, fu membership functions are designed for the variables involved in the polishing process. Fitness function is used to select the best knowledge base. For the development of the parameter setting generation module, the parameter setting is selected with the use of the knowledge base and the input of required su The parameter setting is verified by confirmation experiment. Experimental results show that the parameter setting generated by the system is able to achieve the required surface finish. ii i With the use of the intelligent system, manufacturers can obtain instant technical support, thereby enables production lea

be shortened. The quality of surface finish can be assured. Knowledge of the polish experts can be retained. Fuzzy rules and membership functions stored in the knowledge base can also act as polishing guidelines for hand polishing. The process automation can be speeded up. The intelligent system is expec applied to the determination of parameter settings for polishing other materials. The proposed system can also act as a foundation for incorporating cost factors in the design in the future. In addition, the system can be further developed by the identification of polishing features through a case matching process Computational time is expected to be further reduced. (476 words)

Decision making and control are two fields with distinct methods for solving problems, and yet they are closely related. This book bridges the gap between decision making and control in the field of fuzzy decisions and fuzzy control, and discusses various ways in which fuzzy decision making methods can be a systems modeling and control.Fuzzy decision making is a powerful paradigm for dealing with human expert knowledge when one is designing fuzzy model-based controllers. The combination of fuzzy decision making and fuzzy control in this book can lead to novel control schemes that improve the existing cor various ways. The following applications of fuzzy decision making methods for designing control systems are considered: OCo Fuzzy decision making for enhancing fuzzy modeling. The values of important parameters in fuzzy modeling algorithms are selected by using fuzzy decision making.OCo Fuzzy decisi for designing signal-based fuzzy controllers. The controller mappings and the defuzzification steps can be obtained by decision making methods.OCo Fuzzy design and performance specifications in model-based control. Fuzzy constraints and fuzzy goals are used.OCo Design of model-based controllers comb fuzzy decision modules. Human operator experience is incorporated for the performance specification in model-based control.The advantages of bringing together fuzzy control and fuzzy decision making are shown with multiple examples from real and simulated control systems."

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 excit 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 infor This theory aims to understand and harness the laws of human perceptions to dramatically im prove 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 sci technology and business. In this context, Berkeley Initiative in Soft Computing (BISC), Univer sity of California, Berkeley from one side and Chevron-Texaco from another formed a Technical Committee to organize a Meeting entitled "State of the Art Assessment and New Directions for Research" to understand signifi cance 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, and March 15-17, 2002.

Intelligent Systems

Advances in Computational Intelligence

DNA Computing Based Genetic Algorithm

Co-evolutionary Genetic Algorithm for Fuzzy Modeling

NEURAL NETWORKS, FUZZY LOGIC AND GENETIC ALGORITHM

Modeling, Optimization, and Control

Ever since fuzzy logic was introduced by Lotfi Zadeh in the mid-sixties and genetic algorithms by John Holland in the early seventies, these two fields widely been subjects of academic research the world over. During the last few years, they have been experiencing extremely rapid growth in the industrial world, where they have been shown to be very effective in solving real-world problems. These two substantial fields, together with neurocomputing techniques, are recognized as major parts of soft computing: a set of computing technologies already riding the waves of the next century to produce the human-centered intelligent systems of tomorrow; the collection of papers presented in this book shows the way. The book also contains an extensive bibliography on fuzzy logic and genetic algorithms. Contents:Foreword (L Davies)Preface (E Sanchez, T Shibata & L A Zadeh)Helicopter Flight Control with Fuzzy Logic and Genetic Algorithms (C Philips, C L Karr & G W Walker)Skill Acquisition and Skill-Based Motion Planning for Hierarchical Intelligent Control of a Redundant Manipulator (T Shibata)A Creative Design of Fuzzy Logic Controller Using a Genetic Algorithm (T Hashiyama, T Furuhashi & Y Uchikawa)Automatic Fuzzy Tuning and Its Applications (H Ishigami, T Fukuda, T Shibata)An Evolutionary Algorithm for Fuzzy Controller Synthesis and Optimization Based on SGS-Thomson's W.A.R.P. Fuzzy Processor (R Poluzzi, G G Rizzotto & A G B Tettamanzi)On-Line Self-Structuring Fuzzy Inference Systems for Function Approximation (H Bersini)Fuzzy Classification Based on Adaptive Networks and Genetic Algorithms (C-T Sun & J-S Jang)Intelligent Systems for Fraud Detection (J Kingdon)Genetic Algorithms for Query Optimization in Information Retrieval: Relevance Feedback (D H Kraft, F E Petry, B P Buckles & T Sadasivan)Fuzzy Fitness Assignment in an Interactive Genetic Algorithm for a Cartoon Face Search (K Nishio, M Murakami, E Mizutani & N Honda)An Evolutionary Approach to Simulate Cognitive Feedback Learning in Medical Domain (H S Lopes, M S Coutinho & W C de Lima)A Classified Review on the Combination Fuzzy Logic-Genetic Algorithms Bibliography: 1989–1995 (O Cordón, F Herrera & M Lozano) Readership: Mechanical, systems & knowledge, and control engineers; computer scientists in databases; and researchers in genetic algorithms, fuzzy logic systems, soft computing, artificial intelligence, neural networks, fuzzy logic control, robotics, classification, banking, information retrieval, and medicine. keywords:Genetic Algorithms;Evolutionary Algorithms;Fuzzy Logic Systems;Fuzzy Logic Control;Learning;Fuzzy-Neural Networks;Learning;Soft Computing “This volume displays the power of evolutionary algorithms when combined with fuzzy logic. These are exciting times in the fields of fuzzy logic and evolutionary algorithms, and this book will add to the excitement, because it is the first volume to focus on the growing connections between the fields of evolutionary algorithms and fuzzy logic … This book will be a valuable aid to anyone considering the application of fuzzy logic and evolutionary algorithms to real problems, because it contains a number of detailed accounts of such applications written by authors in several countries. By making these accounts available in one place, the editors of this book have made it much easier for us to benefit from the authors' experience, and have done us a great service.” From the foreword by Lawrence Davies President of Tica Associates and editor of Handbook of Genetic Algorithms

Ever since fuzzy logic was introduced by Lotfi Zadeh in the mid-sixties and genetic algorithms by John Holland in the early seventies, these two fields widely been subjects of academic research the world over. During the last few years, they have been experiencing extremely rapid growth in the industrial world, where they have been shown to be very effective in solving real-world problems. These two substantial fields, together with neurocomputing techniques, are recognized as major parts of soft computing: a set of computing technologies already riding the waves of the next century to produce the human-centered intelligent systems of tomorrow; the collection of papers presented in this book shows the way. The book also contains an extensive bibliography on fuzzy logic and genetic algorithms.

The 30 coherently written chapters by leading researchers presented in this anthology are devoted to basic results achieved in computational intelligence since 1997. The book provides complete coverage of the core issues in the field, especially in fuzzy logic and control as well as for evolutionary optimization algorithms including genetic programming, in a comprehensive and systematic way. Theoretical and methodological investigations are complemented by prototypic applications for design and management tasks in electrical engineering, mechanical engineering, and chemical engineering. This book will become a valuable source of reference for researchers active in computational intelligence. Advanced students and professionals interested in learning about and applying advanced techniques of computational intelligence will appreciate the book as a useful guide enhanced by numerous examples and applications in a variety of fields.

Fuzzy modeling usually comes with two contradictory requirements: interpretability, which is the capability to express the real system behavior in a comprehensible way, and accuracy, which is the capability to faithfully represent the real system. In this framework, one of the most important areas is linguistic fuzzy modeling, where the legibility of the obtained model is the main objective. This task is usually developed by means of linguistic (Mamdani) fuzzy rule-based systems. An active research area is oriented towards the use of new techniques and structures to extend the classical, rigid linguistic fuzzy modeling with the main aim of increasing its precision degree. Traditionally, this accuracy improvement has been carried out without considering the corresponding interpretability loss. Currently, new trends have been proposed trying to preserve the linguistic fuzzy model description power during the optimization process. Written by leading experts in the field, this volume collects some representative researcher that pursue this approach.

Selected Approaches

Advances in Computational Intelligence and Learning

Computational Intelligence: Research Frontiers

Industrial Applications

Genetic Algorithms and Fuzzy Logic Systems

Fuzzy Rulebase Modeling in Information Processing, Classification and Control

A futuristic guide to smart structure technology Through the use of active controllers, a structure can modify its behavior during dynamic loading such as impact, wind, or earthquake loading. Such structures with self-modification capability are called adaptive or smart structures. Smart structure technology prevents loss of life and damage to structures during natural disasters. This cross-disciplinary book features computational models and algorithms for active control of a new generation of large adaptive structures subjected to various types of dynamic loading. An important focus of the book is the optimization of both the structure and control systems in order to minimize costs.

Soft computing is a branch of computing which, unlike hard computing, can deal with uncertain, imprecise and inexact data. The three constituents of soft computing are fuzzy-logic-based computing, neurocomputing, and genetic algorithms. Fuzzy logic contributes the capability of approximate reasoning, neurocomputing offers function approximation and learning capabilities, and genetic algorithms provide a methodology for systematic random search and optimization. These three capabilities are combined in a complementary and synergetic fashion. This book presents a cohesive set of contributions dealing with important issues and applications of soft computing in systems and control technology. The contributions include state-of-the-art material, mathematical developments, fresh results, and how-to-do issues. Among the problems studied via neural, fuzzy, neurofuzzy and genetic methodologies are: data fusion, reinforcement learning, approximation properties, multichannel imaging, signal processing, system optimization, gaming, and several forms of control. The book can serve as a reference for researchers and practitioners in the field. Readers can find in it a large amount of useful and timely information, and thus save considerable effort in searching for other scattered literature. Contents:Neural Networks in System Identification and Control:Supervised Learning in Multilayer Perceptrons: The Back-Propagation Algorithm (S G Tzafestas & Y Anthopoulos)Identification of Two-Dimensional State Space Discrete Systems Using Neural Networks (D Wang & A Zilouchian)Neural Networks for Control (R J Mitchell)Neuro-Based Adaptive Regulator (T Tsuji et al.)Local Model Networks and Self-Tuning Predictive Control (P J Gawthrop & E Ronco)Fuzzy and Neuro-Fuzzy Systems in Modeling, Control and Robot Path Planning:An On-Line Self Constructing Fuzzy Modeling Architecture Based on Neural and Fuzzy Concepts and Techniques (S G Tzafestas & K C Zikidis)Neuro-Fuzzy Model Based Control (D Matko et al.)Fuzzy and Neurofuzzy Approaches to Mobile Robot Path and Motion Planning Under Uncertainty (C S Tzafestas & S G Tzafestas)Genetic-Evolutionary Algorithms:A Tutorial Overview of Genetic Algorithms and Their Applications (S G Tzafestas et al.)Results from a Variety of Genetic Algorithm Applications Showing the Robustness of the Approach (W D Potter et al.)Evolutionary Algorithms in Computer-Aided Design of Integrated Circuits (R Drechsler et al.)Soft Computing Applications:Soft Data Fusion (C G Looney & Y Varol)Application of Neural Networks to Computer Gaming (N Baba)Coherent Neural Networks and Their Applications to Control and Signal Processing (A Hirose)Neural, Fuzzy and Evolutionary Reinforcement Learning Systems: An Application Case Study (D A Linkens & H O Nyongesa)Neural Networks in Industrial and Environmental Applications (G C Smith & C L Wrobel) Readership: Researchers and practitioners in systems and control engineering. Keywords:

During the past few years two principally different approaches to the design of fuzzy controllers have emerged: heuristics-based design and model-based design. The main motivation for the heuristics-based design is given by the fact that many industrial processes are still controlled in one of the following two ways: - The process is controlled manually by an experienced operator. - The process is controlled by an automatic control system which needs manual, on-line 'trimming' of its parameters by an experienced operator. In both cases it is enough to translate in terms of a set of fuzzy if-then rules the operator's manual control algorithm or manual on-line 'trimming' strategy in order to obtain an equally good, or even better, wholly automatic fuzzy control system. This implies that the design of a fuzzy controller can only be done after a manual control algorithm or trimming strategy exists. It is admitted in the literature on fuzzy control that the heuristics-based approach to the design of fuzzy controllers is very difficult to apply to multiple-inputjmultiple-output control problems which represent the largest part of challenging industrial process control applications. Furthermore, the heuristics-based design lacks systematic and formally verifiable tuning tech niques. Also, studies of the stability, performance, and robustness of a closed loop system incorporating a heuristics-based fuzzy controller can only be done via extensive simulations.

Fuzzy Modeling and Genetic Algorithms for Data Mining and ExplorationElsevier

Modeling Uncertainty with Evolutionary Improved "fuzzy Functions"

Theory and Practice

Optimization of Fuzzy Model Using Genetic Algorithm for Process Control Application

The Practical Handbook of Genetic Algorithms

Soft Computing in Systems and Control Technology

Interpretability Issues in Fuzzy Modeling

Fuzzy system modeling (FSM)--meaning the construction of a representation of fuzzy systems models--is a difficult task. It demands an identification of many parameters. This thesis analyses fuzzy-modeling problems and different approaches to cope with it. It focuses on a novel evolutionary FSM approach--the design of "Improved Fuzzy Functions" system models with the use of evolutionary algorithms. In order to promote this analysis, local structures are identified with a new improved fuzzy clustering method and represented with novel "fuzzy functions". The central contribution of this work is the use of evolutionary algorithms--in particular, genetic algorithms--to find uncertainty interval of parameters to improve "Fuzzy Function" models. To replace the standard fuzzy rule bases (FRBs) with the new "Improved Fuzzy Functions" succeeds in capturing essential relationships in structure identification processes and overcomes limitations exhibited by earlier FRB methods because there are abundance of fuzzy operations and hence the difficulty of the choice of amongst the t-norms and co-norms.

Fuzzy Modeling and Control

MODELING ANALYSIS & CONTROL DE

Accuracy Improvements in Linguistic Fuzzy Modeling

Intelligent Hybrid Systems

IEEE World Congress on Computational Intelligence, WCCI 2008, Hong Kong, China, June 1-6, 2008, Plenary/Invited Lectures

Fuzzy Logic, Genetic Algorithms, and Parallel Computing