Genetic Algorithms And Fuzzy Multiobjective Optimization

#genetic algorithms #fuzzy logic #multiobjective optimization #optimization techniques #evolutionary computation

Explore the powerful synergy of Genetic Algorithms and Fuzzy Logic to tackle complex multiobjective optimization problems. This advanced approach offers robust solutions by efficiently balancing conflicting objectives, making it ideal for intricate decision-making scenarios across various domains.

Genetic Algorithms and Fuzzy Multiobjective Optimization

Since the introduction of genetic algorithms in the 1970s, an enormous number of articles together with several significant monographs and books have been published on this methodology. As a result, genetic algorithms have made a major contribution to optimization, adaptation, and learning in a wide variety of unexpected fields. Over the years, many excellent books in genetic algorithm optimization have been published; however, they focus mainly on single-objective discrete or other hard optimization problems under certainty. There appears to be no book that is designed to present genetic algorithms for solving not only single-objective but also fuzzy and multiobjective optimization problems in a unified way. Genetic Algorithms And Fuzzy Multiobjective Optimization introduces the latest advances in the field of genetic algorithm optimization for 0-1 programming, integer programming, nonconvex programming, and job-shop scheduling problems under multiobjectiveness and fuzziness. In addition, the book treats a wide range of actual real world applications. The theoretical material and applications place special stress on interactive decision-making aspects of fuzzy multiobjective optimization for human-centered systems in most realistic situations when dealing with fuzziness. The intended readers of this book are senior undergraduate students, graduate students, researchers, and practitioners in the fields of operations research, computer science, industrial engineering, management science, systems engineering, and other engineering disciplines that deal with the subjects of multiobjective programming for discrete or other hard optimization problems under fuzziness. Real world research applications are used throughout the book to illustrate the presentation. These applications are drawn from complex problems. Examples include flexible scheduling in a machine center, operation planning of district heating and cooling plants, and coal purchase planning in an actual electric power plant.

Evolutionary Algorithms for Solving Multi-Objective Problems

Researchers and practitioners alike are increasingly turning to search, op timization, and machine-learning procedures based on natural selection and natural genetics to solve problems across the spectrum of human endeavor. These genetic algorithms and techniques of evolutionary computation are solv ing problems and inventing new hardware and software that rival human designs. The Kluwer Series on Genetic Algorithms and Evolutionary Computation pub lishes research monographs, edited collections, and graduate-level texts in this rapidly growing field. Primary areas of coverage include the theory, implemen tation, and application of genetic algorithms (GAs), evolution strategies (ESs), evolutionary programming (EP), learning classifier systems (LCSs) and other variants of genetic and evolutionary computation (GEC). The series also pub lishes texts in related fields such as artificial life, adaptive behavior, artificial immune systems, agent-based systems, neural computing, fuzzy systems, and quantum computing as long as GEC techniques are part of or inspiration for the system being described. This encyclopedic volume on the use of the algorithms of genetic and evolu tionary computation for the solution of multi-objective problems is a landmark addition to the literature that comes just in the nick of time. Multi-objective evolutionary algorithms (MOEAs) are receiving increasing and unprecedented attention. Researchers and practitioners are finding an irresistible match be tween the popUlation available in most genetic and evolutionary algorithms and the need in multi-objective problems to approximate the Pareto trade-off curve or surface.

Genetic Algorithms and Engineering Optimization

Im Mittelpunkt dieses Buches steht eines der wichtigsten Optimierungsverfahren der industriellen Ingenieurtechnik: Mit Hilfe genetischer Algorithmen lassen sich Qualität, Design und Zuverlässigkeit von Produkten entscheidend verbessern. Das Verfahren beruht auf der Wahrscheinlichkeitstheorie und lehnt sich an die Prinzipien der biologischen Vererbung an: Die Eigenschaften des Produkts werden, unter Beachtung der äußeren Randbedingungen, schrittweise optimiert. Ein hochaktueller Band international anerkannter Autoren. (03/00)

Evolutionary Algorithms for Solving Multi-Objective Problems

This textbook is a second edition of Evolutionary Algorithms for Solving Multi-Objective Problems, significantly expanded and adapted for the classroom. The various features of multi-objective evolutionary algorithms are presented here in an innovative and student-friendly fashion, incorporating state-of-the-art research. The book disseminates the application of evolutionary algorithm techniques to a variety of practical problems. It contains exhaustive appendices, index and bibliography and links to a complete set of teaching tutorials, exercises and solutions.

Evolutionary Multiobjective Optimization

Evolutionary Multi-Objective Optimization is an expanding field of research. This book brings a collection of papers with some of the most recent advances in this field. The topic and content is currently very fashionable and has immense potential for practical applications and includes contributions from leading researchers in the field. Assembled in a compelling and well-organised fashion, Evolutionary Computation Based Multi-Criteria Optimization will prove beneficial for both academic and industrial scientists and engineers engaged in research and development and application of evolutionary algorithm based MCO. Packed with must-find information, this book is the first to comprehensively and clearly address the issue of evolutionary computation based MCO, and is an essential read for any researcher or practitioner of the technique.

Multi-Objective Optimization

This book brings together the latest findings on efficient solutions of multi/many-objective optimization problems from the leading researchers in the field. The focus is on solving real-world optimization problems using strategies ranging from evolutionary to hybrid frameworks, and involving various computation platforms. The topics covered include solution frameworks using evolutionary to hybrid models in application areas like Analytics, Cancer Research, Traffic Management, Networks and Communications, E-Governance, Quantum Technology, Image Processing, etc. As such, the book offers a valuable resource for all postgraduate students and researchers interested in exploring solution frameworks for multi/many-objective optimization problems.

Multiobjective Genetic Algorithms for Clustering

This is the first book primarily dedicated to clustering using multiobjective genetic algorithms with extensive real-life applications in data mining and bioinformatics. The authors first offer detailed introductions to the relevant techniques – genetic algorithms, multiobjective optimization, soft computing, data mining and bioinformatics. They then demonstrate systematic applications of these techniques to real-world problems in the areas of data mining, bioinformatics and geoscience. The authors offer detailed theoretical and statistical notes, guides to future research, and chapter summaries. The book can be used as a textbook and as a reference book by graduate students and academic and industrial researchers in the areas of soft computing, data mining, bioinformatics and geoscience.

Evolutionary Multi-Criterion Optimization

This book constitutes the refereed proceedings of the First International Conference on Multi-Criterion Optimization, EMO 2001, held in Zurich, Switzerland in March 2001. The 45 revised full papers presented were carefully reviewed and selected from a total of 87 submissions. Also included are two tutorial surveys and two invited papers. The book is organized in topical sections on algorithm improvements, performance assessment and comparison, constraint handling and problem decomposition, uncertainty and noise, hybrid and alternative methods, scheduling, and applications of multi-objective optimization in a variety of fields.

Robust Control Systems with Genetic Algorithms

In recent years, new paradigms have emerged to replace-or augment-the traditional, mathematically based approaches to optimization. The most powerful of these are genetic algorithms (GA), inspired by natural selection, and genetic programming, an extension of GAs based on the optimization of symbolic codes. Robust Control Systems with Genetic Algorithms builds a bridge between genetic algorithms and the design of robust control systems. After laying a foundation in the basics of GAs and genetic programming, it demonstrates the power of these new tools for developing optimal robust controllers for linear control systems, optimal disturbance rejection controllers, and predictive and variable structure control. It also explores the application of hybrid approaches: how to enhance genetic algorithms and programming with fuzzy logic to design intelligent control systems. The authors consider a variety of applications, such as the optimal control of robotic manipulators, flexible links and jet engines, and illustrate a multi-objective, genetic algorithm approach to the design of robust controllers with a gasification plant case study. The authors are all masters in the field and clearly show the effectiveness of GA techniques. Their presentation is your first opportunity to fully explore this cutting-edge approach to robust optimal control system design and exploit its methods for your own applications.

Large Scale Interactive Fuzzy Multiobjective Programming

Simultaneous considerations of multiobjectiveness, fuzziness and block angular structures involved in the real-world decision making problems lead us to the new field of interactive multiobjective optimization for large scale programming problems under fuzziness. The aim of this book is to introduce the latest advances in the new field of interactive multiobjective optimization for large scale programming problems under fuzziness on the basis of the author's continuing research. Special stress is placed on interactive decision making aspects of fuzzy multiobjective optimization for human-centered systems in most realistic situations when dealing with fuzziness. The book is intended for graduate students, researchers and practitioners in the fields of operations research, industrial engineering, management science and computer science.

DNA Computing Based Genetic Algorithm

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.

Multi-Objective Evolutionary Algorithms for Knowledge Discovery from Databases

The present volume provides a collection of seven articles containing new and high quality research results demonstrating the significance of Multi-objective Evolutionary Algorithms (MOEA) for data mining tasks in Knowledge Discovery from Databases (KDD). These articles are written by leading experts around the world. It is shown how the different MOEAs can be utilized, both in individual and integrated manner, in various ways to efficiently mine data from large databases.

Genetic Algorithms

This comprehensive book gives a overview of the latest discussions in the application of genetic algorithms to solve engineering problems. Featuring real-world applications and an accompanying disk, giving the reader the opportunity to use an interactive genetic algorithms demonstration program.

Evolutionary Multi-Criterion Optimization

This book constitutes the refereed proceedings of the Second International Conference on Evolutionary Multi-Criterion Optimization, EMO 2003, held in Faro, Portugal, in April 2003. The 56 revised full papers presented were carefully reviewed and selected from a total of 100 submissions. The papers are organized in topical sections on objective handling and problem decomposition, algorithm improvements, online adaptation, problem construction, performance analysis and comparison, alternative methods, implementation, and applications.

Multi-Objective Machine Learning

Recently, increasing interest has been shown in applying the concept of Pareto-optimality to machine learning, particularly inspired by the successful developments in evolutionary multi-objective optimization. It has been shown that the multi-objective approach to machine learning is particularly successful to improve the performance of the traditional single objective machine learning methods, to generate highly diverse multiple Pareto-optimal models for constructing ensembles models and, and to achieve a desired trade-off between accuracy and interpretability of neural networks or fuzzy systems. This monograph presents a selected collection of research work on multi-objective approach to machine learning, including multi-objective feature selection, multi-objective model selection in training multi-layer perceptrons, radial-basis-function networks, support vector machines, decision trees, and intelligent systems.

Multiobjective Optimization Methodology

The first book to focus on jumping genes outside bioscience and medicine, Multiobjective Optimization Methodology: A Jumping Gene Approach introduces jumping gene algorithms designed to supply adequate, viable solutions to multiobjective problems quickly and with low computational cost. Better Convergence and a Wider Spread of Nondominated Solutions The book begins with a thorough review of state-of-the-art multiobjective optimization techniques. For readers who may not be familiar with the bioscience behind the jumping gene, it then outlines the basic biological gene transposition process and explains the translation of the copy-and-paste and cut-and-paste operations into a computable language. To justify the scientific standing of the jumping genes algorithms, the book provides rigorous mathematical derivations of the jumping genes operations based on schema theory. It also discusses a number of convergence and diversity performance metrics for measuring the usefulness of the algorithms. Practical Applications of Jumping Gene Algorithms Three practical engineering applications showcase the effectiveness of the jumping gene algorithms in terms of the crucial trade-off between convergence and diversity. The examples deal with the placement of radio-to-fiber repeaters in wireless local-loop systems, the management of resources in WCDMA systems, and the placement of base stations in wireless local-area networks. Offering insight into multiobjective optimization, the authors show how jumping gene algorithms are a useful addition to existing evolutionary algorithms, particularly to obtain quick convergence solutions and solutions to outliers.

Evolutionary Multi-Objective System Design

Real-world engineering problems often require concurrent optimization of several design objectives, which are conflicting in cases. This type of optimization is generally called multi-objective or multi-criterion optimization. The area of research that applies evolutionary methodologies to multi-objective optimization is of special and growing interest. It brings a viable computational solution to many real-world problems. Generally, multi-objective engineering problems do not have a straightforward optimal design.

These kinds of problems usually inspire several solutions of equal efficiency, which achieve different trade-offs. Decision makers' preferences are normally used to select the most adequate design. Such preferences may be dictated before or after the optimization takes place. They may also be introduced interactively at different levels of the optimization process. Multi-objective optimization methods can be subdivided into classical and evolutionary. The classical methods usually aim at a single solution while the evolutionary methods provide a whole set of so-called Pareto-optimal solutions. Evolutionary Multi-Objective System Design: Theory and Applications provides a representation of the state-of-the-art in evolutionary multi-objective optimization research area and related new trends. It reports many innovative designs yielded by the application of such optimization methods. It also presents the application of multi-objective optimization to the following problems: Embrittlement of stainless steel coated electrodes Learning fuzzy rules from imbalanced datasets Combining multi-objective evolutionary algorithms with collective intelligence Fuzzy gain scheduling control Smart placement of roadside units in vehicular networks Combining multi-objective evolutionary algorithms with quasi-simplex local search Design of robust substitution boxes Protein structure prediction problem Core assignment for efficient network-on-chip-based system design

Multiobjective Optimization

This text offers many multiobjective optimization methods accompanied by analytical examples, and it treats problems not only in engineering but also operations research and management. It explains how to choose the best method to solve a problem and uses three primary application examples: optimization of the numerical simulation of an industrial process; sizing of a telecommunication network; and decision-aid tools for the sorting of bids.

Evolutionary and Swarm Intelligence Algorithms

This book is a delight for academics, researchers and professionals working in evolutionary and swarm computing, computational intelligence, machine learning and engineering design, as well as search and optimization in general. It provides an introduction to the design and development of a number of popular and recent swarm and evolutionary algorithms with a focus on their applications in engineering problems in diverse domains. The topics discussed include particle swarm optimization, the artificial bee colony algorithm, Spider Monkey optimization algorithm, genetic algorithms, constrained multi-objective evolutionary algorithms, genetic programming, and evolutionary fuzzy systems. A friendly and informative treatment of the topics makes this book an ideal reference for beginners and those with experience alike.

Multi-Objective Optimization in Computational Intelligence: Theory and Practice

Multi-objective optimization (MO) is a fast-developing field in computational intelligence research. Giving decision makers more options to choose from using some post-analysis preference information, there are a number of competitive MO techniques with an increasingly large number of MO real-world applications. Multi-Objective Optimization in Computational Intelligence: Theory and Practice explores the theoretical, as well as empirical, performance of MOs on a wide range of optimization issues including combinatorial, real-valued, dynamic, and noisy problems. This book provides scholars, academics, and practitioners with a fundamental, comprehensive collection of research on multi-objective optimization techniques, applications, and practices.

Controller Tuning with Evolutionary Multiobjective Optimization

This book is devoted to Multiobjective Optimization Design (MOOD) procedures for controller tuning applications, by means of Evolutionary Multiobjective Optimization (EMO). It presents developments in tools, procedures and guidelines to facilitate this process, covering the three fundamental steps in the procedure: problem definition, optimization and decision-making. The book is divided into four parts. The first part, Fundamentals, focuses on the necessary theoretical background and provides specific tools for practitioners. The second part, Basics, examines a range of basic examples regarding the MOOD procedure for controller tuning, while the third part, Benchmarking, demonstrates how the MOOD procedure can be employed in several control engineering problems. The fourth part, Applications, is dedicated to implementing the MOOD procedure for controller tuning in real processes.

Multiple Criteria Optimization

The generalized area of multiple criteria decision making (MCDM) can be defined as the body of methods and procedures by which the concern for multiple conflicting criteria can be formally incorporated into the analytical process. MCDM consists mostly of two branches, multiple criteria optimization and multi-criteria decision analysis (MCDA). While MCDA is typically concerned with multiple criteria problems that have a small number of alternatives often in an environment of uncertainty (location of an airport, type of drug rehabilitation program), multiple criteria optimization is typically directed at problems formulated within a mathematical programming framework, but with a stack of objectives instead of just one (river basin management, engineering component design, product distribution). It is about the most modern treatment of multiple criteria optimization that this book is concerned. I look at this book as a nicely organized and well-rounded presentation of what I view as ”new wave” topics in multiple criteria optimization. Looking back to the origins of MCDM, most people agree that it was not until about the early 1970s that multiple criteria optimization c- gealed as a field. At this time, and for about the following fifteen years, the focus was on theories of multiple objective linear programming that subsume conventional (single criterion) linear programming, algorithms for characterizing the efficient set, theoretical vector-maximum dev- opments, and interactive procedures.

Evolutionary Multi-Criterion Optimization

This book constitutes the refereed proceedings of the Third International Conference on Evolutionary Multi-Criterion Optimization, EMO 2005, held in Guanajuato, Mexico, in March 2005. The 59 revised full papers presented together with 2 invited papers and the summary of a tutorial were carefully reviewed and selected from the 115 papers submitted. The papers are organized in topical sections on algorithm improvements, incorporation of preferences, performance analysis and comparison, uncertainty and noise, alternative methods, and applications in a broad variety of fields.

Multiobjective Optimum Design of Static and Seismic-resistant Structures with Genetic Algorithm, Fuzzy Logic and Game Theory

"The goal of this research is to develop a constrained multiobjective optimization method in the form of a robust, practical, problem-independent algorithm, and to investigate the effect of multiobjective optimization on structural design. This research studies the properties and characteristics of multiobjective optimization and solutions. Design objectives, constraints and design variables as well as their effect on structural design and behaviors are investigated. Dynamic input energy for a multidegree-of-freedom structure is formulated. A multiobjective optimization algorithm based on game theory is developed. Fuzzy set theory is introduced to construct a fuzzy constrained environment. A Pareto genetic algorithm is developed based on a simple genetic algorithm. Two new genetic algorithm operators -- multiobjective fitness function and niche method -- are proposed. A new genetic algorithm process -- Pareto set filter -- is added to genetic algorithms. Finally, a multiobjective optimization algorithm, which is robust and performs uniformly well on a broad range of problems, is developed with genetic algorithm, fuzzy logic and game theory. Six frame structures and five truss structures have been optimally designed with static load, seismic excitation, and active control. Materials for the structures are steel, reinforced concrete, and a combination of both. Optimization goals cover weight, structural cost, displacement, strain energy, input energy, potential energy, and performance index. Constraints include stress, displacement, frequency, and ratio of story stiffness. The numerical results show that the newly developed algorithms can locate a global solution and Pareto optimum set which are usually difficult to find"--Abstract, leaf iii.

Knowledge Incorporation in Evolutionary Computation

Incorporation of a priori knowledge, such as expert knowledge, meta-heuristics and human preferences, as well as domain knowledge acquired during evolu tionary search, into evolutionary algorithms has received increasing interest in the recent years. It has been shown from various motivations that knowl edge incorporation into evolutionary search is able to significantly improve search efficiency. However, results on knowledge incorporation in evolution ary computation have been scattered in a wide range of research areas and a systematic handling of this important topic in evolutionary computation still lacks. This edited book is a first attempt to put together the state-of-art and re cent advances on knowledge incorporation in evolutionary computation within a unified framework. Existing methods for knowledge incorporation are di vided into the following five categories according to the functionality of the incorporated knowledge in the evolutionary algorithms. 1. Knowledge incorporation in representation, population initialization, - combination and mutation. 2. Knowledge incorporation in

selection and reproduction. 3. Knowledge incorporation in fitness evaluations. 4. Knowledge incorporation through life-time learning and human-computer interactions. 5. Incorporation of human preferences in multi-objective evolutionary com putation. The intended readers of this book are graduate students, researchers and practitioners in all fields of science and engineering who are interested in evolutionary computation. The book is divided into six parts. Part I contains one introductory chapter titled "A selected introduction to evolutionary computation" by Yao, which presents a concise but insightful introduction to evolutionary computation.

Computational Intelligence in Reliability Engineering

This book covers the recent applications of computational intelligence techniques in reliability engineering. This volume contains a survey of the contributions made to the optimal reliability design literature in recent years. It also contains chapters devoted to different applications of a genetic algorithm in reliability engineering and to combinations of this algorithm with other computational intelligence techniques.

Applications of Multi-objective Evolutionary Algorithms

- Detailed MOEA applications discussed by international experts - State-of-the-art practical insights in tackling statistical optimization with MOEAs - A unique monograph covering a wide spectrum of real-world applications - Step-by-step discussion of MOEA applications in a variety of domains

Cooperative and Noncooperative Multi-Level Programming

To derive rational and convincible solutions to practical decision making problems in complex and hierarchical human organizations, the decision making problems are formulated as relevant mathematical programming problems which are solved by developing optimization techniques so as to exploit characteristics or structural features of the formulated problems. In particular, for resolving con?ict in decision making in hierarchical managerial or public organizations, the multi level formula tion of the mathematical programming problems has been often employed together with the solution concept of Stackelberg equilibrium. However,weconceivethatapairoftheconventionalformulationandthesolution concept is not always suf?cient to cope with a large variety of decision making situations in actual hierarchical organizations. The following issues should be taken into consideration in expression and formulation of decision making problems. Informulationofmathematicalprogrammingproblems,itistacitlysupposedthat decisions are made by a single person while game theory deals with economic be havior of multiple decision makers with fully rational judgment. Because two level mathematical programming problems are interpreted as static Stackelberg games, multi level mathematical programming is relevant to noncooperative game theory; in conventional multi level mathematical programming models employing the so lution concept of Stackelberg equilibrium, it is assumed that there is no communi cation among decision makers, or they do not make any binding agreement even if there exists such communication. However, for decision making problems in such as decentralized large ?rms with divisional independence, it is quite natural to sup pose that there exists communication and some cooperative relationship among the decision makers.

Evolutionary Multi-Criterion Optimization

This book constitutes the refereed proceedings of the 5th International Conference on Evolutionary Multi-Criterion Optimization, EMO 2009, held in Nantes, France in April 2009. The 39 revised full papers presented together with 5 invited talks were carefully reviewed and selected from 72 submissions. The papers are organized in topical sections on theoretical analysis, uncertainty and noise, algorithm development, performance analysis and comparison, applications, MCDM Track, Many objectives, alternative methods, as well as EMO and MCDA.

Multiobjective Evolutionary Algorithms and Applications

Evolutionary multiobjective optimization is currently gaining a lot of attention, particularly for researchers in the evolutionary computation communities. Covers the authors’ recent research in the area of multiobjective evolutionary algorithms as well as its practical applications.

Information Processing with Evolutionary Algorithms

Provides a broad sample of current information processing applications Includes examples of successful applications that will encourage practitioners to apply the techniques described in the book to real-life problems

Parallel Problem Solving from Nature - PPSN VIII

This book constitutes the refereed proceedings of the 8th International Conference on Parallel Problem Solving from Nature, PPSN 2004, held in Birmingham, UK, in September 2004. The 119 revised full papers presented were carefully reviewed and selected from 358 submissions. The papers address all current issues in biologically inspired computing; they are organized in topical sections on theoretical and foundational issues, new algorithms, applications, multi-objective optimization, co-evolution, robotics and multi-agent systems, and learning classifier systems and data mining.

Advances in Metaheuristics for Hard Optimization

Many advances have recently been made in metaheuristic methods, from theory to applications. The editors, both leading experts in this field, have assembled a team of researchers to contribute 21 chapters organized into parts on simulated annealing, tabu search, ant colony algorithms, general purpose studies of evolutionary algorithms, applications of evolutionary algorithms, and metaheuristics.

Genetic Algorithms and Fuzzy Logic Systems

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

Multi-Objective Optimization in Theory and Practice II: Metaheuristic Algorithms

Multi-Objective Optimization in Theory and Practice is a simplified two-part approach to multi-objective optimization (MOO) problems. This second part focuses on the use of metaheuristic algorithms in more challenging practical cases. The book includes ten chapters that cover several advanced MOO techniques. These include the determination of Pareto-optimal sets of solutions, metaheuristic algorithms, genetic search algorithms and evolution strategies, decomposition algorithms, hybridization of different metaheuristics, and many-objective (more than three objectives) optimization and parallel computation. The final section of the book presents information about the design and types of fifty test problems for which the Pareto-optimal front is approximated. For each of them, the package NSGA-II is used to approximate the Pareto-optimal front. It is an essential handbook for students and teachers involved in advanced optimization courses in engineering, information science and mathematics degree programs.

Fuzzy Logic Hybrid Extensions of Neural and Optimization Algorithms: Theory and Applications

We describe in this book, recent developments on fuzzy logic, neural networks and optimization algorithms, as well as their hybrid combinations, and their application in areas such as, intelligent control and robotics, pattern recognition, medical diagnosis, time series prediction and optimization of complex problems. The book contains a collection of papers focused on hybrid intelligent systems based on soft computing. There are some papers with the main theme of type-1 and type-2 fuzzy logic, which basically consists of papers that propose new concepts and algorithms based on type-1 and type-2 fuzzy logic and their applications. There also some papers that presents theory and practice of meta-heuristics in different areas of application. Another group of papers describe diverse applications of fuzzy logic, neural networks and hybrid intelligent systems in medical applications. There are also some papers that present theory and practice of neural networks in different areas of application. In addition, there are papers that present theory and practice of optimization and evolutionary algorithms in different areas of application. Finally, there are some papers describing applications of fuzzy logic, neural networks and meta-heuristics in pattern recognition problems.

Evolutionary Multi-Criterion Optimization

This book constitutes the refereed proceedings of the 4th International Conference on Evolutionary Multi-Criterion Optimization, EMO 2007, held in Matsushima, Japan in March 2007. The 65 revised full papers presented together with 4 invited papers are organized in topical sections on algorithm design, algorithm improvements, alternative methods, applications, engineering design, many objectives, objective handling, and performance assessments.

Modeling Applications and Theoretical Innovations in Interdisciplinary Evolutionary Computation

Evolutionary computation has emerged as a major topic in the scientific community as many of its techniques have successfully been applied to solve problems in a wide variety of fields. Modeling Applications and Theoretical Innovations in Interdisciplinary Evolutionary Computation provides comprehensive research on emerging theories and its aspects on intelligent computation. Particularly focusing on breaking trends in evolutionary computing, algorithms, and programming, this publication serves to support professionals, government employees, policy and decision makers, as well as students in this scientific field.

Multiobjective Optimization

Multiobjective optimization deals with solving problems having not only one, but multiple, often conflicting, criteria. Such problems can arise in practically every field of science, engineering and business, and the need for efficient and reliable solution methods is increasing. The task is challenging due to the fact that, instead of a single optimal solution, multiobjective optimization results in a number of solutions with different trade-offs among criteria, also known as Pareto optimal or efficient solutions. Hence, a decision maker is needed to provide additional preference information and to identify the most satisfactory solution. Depending on the paradigm used, such information may be introduced before, during, or after the optimization process. Clearly, research and application in multiobjective optimization involve expertise in optimization as well as in decision support. This state-of-the-art survey originates from the International Seminar on Practical Approaches to Multiobjective Optimization, held in Dagstuhl Castle, Germany, in December 2006, which brought together leading experts from various contemporary multiobjective optimization fields, including evolutionary multiobjective optimization (EMO), multiple criteria decision making (MCDM) and multiple criteria decision aiding (MCDA). This book gives a unique and detailed account of the current status of research and applications in the field of

multiobjective optimization. It contains 16 chapters grouped in the following 5 thematic sections: Basics on Multiobjective Optimization; Recent Interactive and Preference-Based Approaches; Visualization of Solutions; Modelling, Implementation and Applications; and Quality Assessment, Learning, and Future Challenges.

Fuzzy Stochastic Multiobjective Programming

Although studies on multiobjective mathematical programming under uncertainty have been accumulated and several books on multiobjective mathematical programming under uncertainty have been published (e.g., Stancu-Minasian (1984); Slowinski and Teghem (1990); Sakawa (1993); Lai and Hwang (1994); Sakawa (2000)), there seems to be no book which concerns both randomness of events related to environments and fuzziness of human judgments simultaneously in multiobjective decision making problems. In this book, the authors are concerned with introducing the latest advances in the field of multiobjective optimization under both fuzziness and randomness on the basis of the authors' continuing research works. Special stress is placed on interactive decision making aspects of fuzzy stochastic multiobjective programming for human-centered systems under uncertainty in most realistic situations when dealing with both fuzziness and randomness. Organization of each chapter is briefly summarized as follows: Chapter 2 is devoted to mathematical preliminaries, which will be used throughout the remainder of the book. Starting with basic notions and methods of multiobjective programming, interactive fuzzy multiobjective programming as well as fuzzy multiobjective programming is outlined. In Chapter 3, by considering the imprecision of decision maker's (DM's) judgment for stochastic objective functions and/or constraints in multiobjective problems, fuzzy multiobjective stochastic programming is developed. In Chapter 4, through the consideration of not only the randomness of parameters involved in objective functions and/or constraints but also the experts' ambiguous understanding of the realized values of the random parameters, multiobjective programming problems with fuzzy random variables are formulated. In Chapter 5, for resolving conflict of decision making problems in hierarchical managerial or public organizations where there exist two DMs who have different priorities in making decisions, two-level programming problems are discussed. Finally, Chapter 6 outlines some future research directions.