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Nature-Inspired Optimization Algorithms-Xin-She Yang 2014-02-17 Nature-Inspired Optimization Algorithms provides a systematic introduction to all major nature-inspired algorithms for optimization. The book's unified approach, balancing algorithm introduction, theoretical background and practical implementation, complements extensive literature with well-chosen case studies to illustrate how these algorithms work. Topics include particle swarm optimization, ant and bee algorithms, simulated annealing, cuckoo search, firefly algorithm, bat algorithm, flower algorithm, harmony search, algorithm analysis, constraint handling, hybrid methods, parameter tuning and control, as well as multi-objective optimization. This book can serve as an introductory book for graduates, doctoral students and lecturers in computer science, engineering and natural sciences. It can also serve as a source of inspiration for new applications. Researchers and engineers as well as experienced experts will also find it a handy reference. Discusses and summarizes the latest developments in nature-inspired algorithms with comprehensive, timely literature Provides a theoretical understanding as well as practical implementation hints Provides a step-by-step introduction to each algorithm

Nature-Inspired Metaheuristic Algorithms-Xin-She Yang 2008 Modern metaheuristic algorithms such as bee algorithms and harmony search start to demonstrate their power in dealing with tough optimization problems and even NP-hard problems. This book reviews and introduces the state-of-the-art nature-inspired metaheuristic algorithms in optimization, including genetic algorithms, bee algorithms, particle swarm optimization, simulated annealing, ant colony optimization, harmony search, and firefly algorithms. We also briefly introduce the photosynthetic algorithm, the enzyme algorithm, and Tabu search. Worked examples with implementation have been used to show how each algorithm works. This book is thus an ideal textbook for an undergraduate and/or graduate course. As some of the algorithms such as the harmony search and firefly algorithms are at the forefront of current research, this book can also serve as a reference book for researchers.

Search and Optimization by Metaheuristics-Ke-Lin Du 2016-07-20 This textbook provides a comprehensive introduction to nature-inspired metaheuristic methods for search and optimization, including the latest trends in evolutionary algorithms and other forms of natural computing. Over 100 different types of these methods are discussed in detail. The authors emphasize non-standard optimization problems and utilize a natural approach to the topic, moving from basic notions to more complex ones. An introductory chapter covers the necessary biological and mathematical backgrounds for understanding the main material. Subsequent chapters then explore almost all of the major metaheuristics for search and optimization created based on natural phenomena, including simulated annealing, recurrent neural networks, genetic algorithms and genetic programming, differential evolution, memetic algorithms, particle swarm optimization, artificial immune systems, ant colony optimization, tabu search and scatter search, bee and bacteria foraging algorithms, harmony search, biomolecular computing, quantum computing, and many others. General topics on dynamic, multimodal, constrained, and multiobjective optimizations are also described. Each chapter includes detailed flowcharts that illustrate specific algorithms and exercises that reinforce important topics. Introduced in the appendix are some benchmarks for the evaluation of metaheuristics. Search and Optimization by Metaheuristics is intended primarily as a textbook for graduate and advanced undergraduate students specializing in engineering and computer science. It will also serve as a valuable resource for scientists and researchers working in these areas, as well as those who are interested in search and optimization methods.

Nature-Inspired Algorithms and Applied Optimization-Xin-She Yang 2017-10-08 This book reviews the state-of-the-art developments in nature-inspired algorithms and their applications in various disciplines, ranging from feature selection and engineering design optimization to scheduling and vehicle routing. It introduces each algorithm and its implementation with case studies as well as extensive literature reviews, and also includes self-contained chapters featuring theoretical analyses, such as convergence analysis and no-free-lunch theorems so as to provide insights into the current nature-inspired optimization algorithms. Topics include ant colony optimization, the bat algorithm, B-spline curve fitting, cuckoo search, feature selection, economic load dispatch, the firefly algorithm, the flower pollination algorithm, knapsack problem, octonian and quaternion representations, particle swarm optimization, scheduling, wireless networks, vehicle routing with time windows, and maximally different alternatives. This timely book serves as a practical guide and reference resource for students, researchers and professionals.

Swarm Intelligence Algorithms-Adam Slowik 2020-08-25 Nature-based algorithms play an important role among artificial intelligence algorithms. Among them are global optimization algorithms called swarm intelligence algorithms. These algorithms that use the behavior of simple agents and various ways of cooperation between them, are used to solve specific problems that are defined by the so-called objective function. Swarm intelligence algorithms are inspired by the social behavior of various animal species, e.g. ant colonies, bird flocks, bee swarms, schools of fish, etc. The family of these algorithms is very large and additionally includes various types of modifications to enable swarm intelligence algorithms to solve problems dealing with areas other than those for which they were originally developed. This book presents 24 swarm algorithms together with their modifications and practical applications. Each chapter is devoted to one algorithm. It contains a short description along with a pseudo-code showing the various stages of its operation. In addition, each chapter contains a description of selected modifications of the algorithm and shows how it can be used to solve a selected practical problem. This book should also be useful for undergraduate and postgraduate students studying nature-based optimization algorithms, and can be a helpful tool for learning these algorithms, along with their modifications and practical applications. In addition, it can be a useful source of knowledge for scientists working in the field of artificial intelligence, as well as for engineers interested in using this type of algorithms in their work. If the reader wishes to expand his knowledge beyond the basics of swarm intelligence algorithms presented in this book and is interested in more detailed information, we recommend the book "Swarm Intelligence Algorithms: A Tutorial" (Edited by A. Slowik, CRC Press, 2020). It contains a detailed explanation of how each algorithm works, along with relevant program codes in Matlab and the C ++ programming language, as well as numerical examples illustrating step-by-step how individual algorithms work.

Cuckoo Search and Firefly Algorithm-Xin-She Yang 2013-11-27 Nature-inspired algorithms such as cuckoo search and firefly algorithm have become popular and widely used in recent years in many applications. These algorithms are flexible, efficient and easy to implement. New progress has been made in the last few years, and it is timely to summarize the latest developments of cuckoo search and firefly algorithm and their diverse applications. This book will review both theoretical studies and applications with detailed algorithm analysis, implementation and case studies so that readers can benefit most from this book. Application topics are contributed by many leading experts in the field. Topics include cuckoo search, firefly algorithm, algorithm analysis, feature selection, image processing, travelling salesman problem, neural network, GPU optimization, scheduling, queuing, multi-objective manufacturing optimization, semantic web service, shape optimization, and others. This book can serve as an ideal reference for both graduates and researchers in computer science, evolutionary computing, machine learning, computational intelligence, and optimization, as well as engineers in business intelligence, knowledge management and information technology.

Engineering Optimization-Xin-She Yang 2010-07-20 An accessible introduction to metaheuristics and optimization, featuring powerful and modern algorithms for application across engineering and the sciences From engineering and computer science to economics and management science, optimization is a core component for problem solving. Highlighting the latest developments that have evolved in recent years, Engineering Optimization: An Introduction with Metaheuristic Applications outlines popular metaheuristic algorithms and equips readers with the skills needed to apply these techniques to their own optimization problems. With insightful examples from various fields of study, the author highlights key concepts and techniques for the successful application of commonly-used metaheuristic algorithms, including simulated annealing, particle swarm optimization, harmony search, and genetic algorithms. The author introduces all major metaheuristic algorithms and their applications in optimization through a presentation that is organized into three succinct parts: Foundations of Optimization and Algorithms provides a brief introduction to the underlying nature of optimization and the common approaches to optimization problems, random number generation, the Monte Carlo method, and the Markov chain Monte Carlo method Metaheuristic Algorithms presents common metaheuristic algorithms in detail, including genetic algorithms, simulated annealing, ant algorithms, bee algorithms, particle swarm optimization, firefly algorithms, and harmony search Applications outlines a wide range of applications that use metaheuristic algorithms to solve challenging optimization problems with detailed implementation while also introducing various modifications used for multi-objective optimization Throughout the book, the author presents worked-out examples and real-world applications that illustrate the modern relevance of the topic. A detailed appendix features important and popular algorithms using MATLAB® and Octave software packages, and a related FTP site houses MATLAB code and programs for easy implementation of the discussed techniques. In addition, references to the current literature enable readers to investigate individual algorithms and methods in greater detail.

Engineering Optimization: An Introduction with Metaheuristic Applications is an excellent book for courses on optimization and computer simulation at the upper-undergraduate and graduate levels. It is also a valuable reference for researchers and practitioners working in the fields of mathematics, engineering, computer science, operations research, and management science who use metaheuristic algorithms to solve problems in their everyday work.

Metaheuristic Optimization: Nature-Inspired Algorithms Swarm and Computational Intelligence, Theory and Applications-Modestus O. Okwu 2020-11-13 This book exemplifies how algorithms are developed by mimicking nature. Classical techniques for solving day-to-day problems is time-consuming and cannot address complex problems. Metaheuristic algorithms are nature-inspired optimization techniques for solving real-life complex problems. This book emphasizes the social behaviour of insects, animals and other natural entities, in terms of converging power and benefits. Major nature-inspired algorithms discussed in this book include the bee colony algorithm, ant colony algorithm, grey wolf optimization algorithm, whale optimization algorithm, firefly algorithm, bat algorithm, ant lion optimization algorithm, grasshopper optimization algorithm, butterfly optimization algorithm and others. The algorithms have been arranged in chapters to help readers gain better insight into nature-inspired systems and swarm intelligence. All the MATLAB codes have been provided in the appendices of the book to enable readers practice how to solve examples included in all sections. This book is for experts in Engineering and Applied Sciences, Natural and Formal Sciences, Economics, Humanities and Social Sciences.

Swarm Intelligence Algorithms-Adam Slowik 2020-08-25 Swarm intelligence algorithms are a form of nature-based optimization algorithms. Their main inspiration is the cooperative behavior of animals within specific communities. This can be described as simple behaviors of individuals along with the mechanisms for sharing knowledge between them, resulting in the complex behavior of the entire community. Examples of such behavior can be found in ant colonies, bee swarms, schools of fish or bird flocks. Swarm intelligence algorithms are used to solve difficult optimization problems for which there are no exact solving methods or the use of such methods is impossible, e.g. due to unacceptable computational time. This book thoroughly presents the basics of 24 algorithms selected from the entire family of swarm intelligence algorithms. Each chapter deals with a different algorithm describing it in detail and showing how it works in the form of a pseudo-code. In addition, the source code is provided for each algorithm in Matlab and in the C ++ programming language. In order to better understand how each swarm intelligence algorithm works, a simple numerical example is included in each chapter, which guides the reader step by step through the individual stages of the algorithm, showing all necessary calculations. This book can provide the basics for understanding how swarm intelligence algorithms work, and aid readers in programming these algorithms on their own to solve various computational problems. This book should also be useful for undergraduate and postgraduate students studying nature-based optimization algorithms, and can be a helpful tool for learning the basics of these algorithms efficiently and quickly. In addition, it can be a useful source of knowledge for scientists working in the field of artificial intelligence, as well as for engineers interested in using this type of algorithms in their work. If the reader already has basic knowledge of swarm intelligence algorithms, we recommend the book: "Swarm Intelligence Algorithms: Modifications and Applications" (Edited by A. Slowik, CRC Press, 2020), which describes selected modifications of these algorithms and presents their practical applications.

Introduction to Nature-Inspired Optimization-George Lindfield 2017-08-10 Introduction to Nature-Inspired Optimization brings together many of the innovative mathematical methods for non-linear optimization that have their origins in the way various species behave in order to optimize their chances of survival. The book describes each method, examines their strengths and weaknesses, and where appropriate, provides the MATLAB code to give practical insight into the detailed structure of these methods and how they work. Nature-inspired algorithms emulate processes that are found in the natural world, spurring interest for optimization. Lindfield/Penny provide concise coverage to all the major algorithms, including genetic algorithms, artificial bee colony algorithms, ant colony optimization and the cuckoo search algorithm, among others. This book provides a quick reference to practicing engineers, researchers and graduate students who work in the field of optimization. Applies concepts in nature and biology to develop new algorithms for nonlinear optimization Offers working MATLAB® programs for the major algorithms described, applying them to a range of problems Provides useful comparative studies of the algorithms, highlighting their strengths and weaknesses Discusses the current state-of-the-field and indicates possible areas of future development

Metaheuristic Computation with MATLAB®-Erik Cuevas 2020-09-14 Metaheuristic algorithms are considered as generic optimization tools that can solve very complex problems characterized by having very large search spaces. Metaheuristic methods reduce the effective size of the search space through the use of effective search strategies. Book Features: Provides a unified view of the most popular metaheuristic methods currently in use Includes the necessary concepts to enable readers to implement and modify already known metaheuristic methods to solve problems Covers design aspects and implementation in MATLAB® Contains numerous examples of problems and solutions that demonstrate the power of these methods of optimization The material has been written from a teaching perspective and, for this reason, this book is primarily intended for undergraduate and postgraduate students of artificial intelligence, metaheuristic methods, and/or evolutionary computation. The objective is to bridge the gap between metaheuristic techniques and complex optimization problems that profit from the convenient properties of metaheuristic approaches. Therefore, engineer practitioners who are not familiar with metaheuristic computation will appreciate that the techniques discussed are beyond simple theoretical tools, since they have been adapted to solve significant problems that commonly arise in such areas.

Optimization Algorithms-Ozgur Baskan 2016-09-21 This book covers state-of-the-art optimization methods and their applications in wide range especially for researchers and practitioners who wish to improve their knowledge in this field. It consists of 13 chapters divided into two parts: (I) Engineering applications, which presents some new applications of different methods, and (II) Applications in various areas, where recent contributions of state-of-the-art optimization methods to diverse fields are presented.

Nature-Inspired Optimization Algorithms-Xin-She Yang 2020-09-18 Nature-Inspired Optimization Algorithms, Second Edition provides an introduction to all major nature-inspired algorithms for optimization. The book's unified approach, balancing algorithm introduction, theoretical background and practical implementation, complements extensive literature with case studies to illustrate how these algorithms work. Topics include particle swarm optimization, ant and bee algorithms, simulated annealing, cuckoo search, firefly algorithm, bat algorithm, flower algorithm, harmony search, algorithm analysis, constraint handling, hybrid methods, parameter tuning and control, and multi-objective optimization. This book can serve as an introductory book for graduates, for lecturers in computer science, engineering and natural sciences, and as a source of inspiration for new applications. Discusses and summarizes the latest developments in nature-inspired algorithms with comprehensive, timely literature Provides a theoretical understanding and practical implementation hints Presents a step-by-step introduction to each algorithm Includes four new chapters covering mathematical foundations, techniques for solving discrete and combination optimization problems, data mining techniques and their links to optimization algorithms, and the latest deep learning techniques, background and various applications

Glowworm Swarm Optimization-Krishnanand N. Kaipa 2017-01-10 This book provides a comprehensive account of the glowworm swarm optimization (GSO) algorithm, including details of the underlying ideas, theoretical foundations, algorithm development, various applications, and MATLAB programs for the basic GSO algorithm. It also discusses several research problems at different levels of sophistication that can be attempted by interested researchers. The generality of the GSO algorithm is evident in its application to diverse problems ranging from optimization to robotics. Examples include computation of multiple optima, annual crop planning, cooperative exploration, distributed search, multiple source localization, contaminant boundary mapping, wireless sensor networks, clustering, knapsack, numerical integration, solving fixed point equations, solving systems of nonlinear equations, and engineering design optimization. The book is a valuable resource for researchers as well as graduate and undergraduate students in the area of swarm intelligence and computational intelligence and working on these topics.

An Introduction to Computational Engineering with Matlab-Xin-She Yang 2006 This book strives to provide a concise introduction to computational engineering by introducing a wide range of numerical methods commonly used, such as finite difference methods, finite volume methods, finite element methods, and virtual bee algorithms. (Computer Books)

Swarm Intelligence and Bio-Inspired Computation-Xin-She Yang 2013-05-16 Swarm Intelligence and bio-inspired computation have become increasing popular in the last two decades. Bio-inspired algorithms such as ant colony algorithms, bat algorithms, bee algorithms, firefly algorithms, cuckoo search and particle swarm optimization have been applied in almost every area of science and engineering with a dramatic increase of number of relevant publications. This book reviews the latest developments in swarm intelligence and bio-inspired computation from both the theory and application side, providing a complete resource that analyzes and discusses the latest and future trends in research directions. It can help new researchers to carry out timely research and inspire readers to develop new algorithms. With its impressive breadth and depth, this book will be useful for advanced undergraduate students, PhD students and lecturers in computer science, engineering and science as well as researchers and engineers. Focuses on the introduction and analysis of key algorithms Includes case studies for real-world applications Contains a balance of theory and applications, so readers who are interested in either algorithm or applications will all benefit from this timely book.

Fundamental Research in Electrical Engineering-Shahram Montaser Kouhsari 2018-08-29 This volume presents the selected papers of the First International Conference on Fundamental Research in Electrical Engineering, held at Khwarazmi University, Tehran, Iran in July, 2017. The selected papers cover the whole spectrum of the main four fields of Electrical Engineering (Electronic, Telecommunications, Control, and Power Engineering).

Bio-Inspired Computation and Applications in Image Processing-Xin-She Yang 2016-08-09 Bio-Inspired Computation and Applications in Image Processing summarizes the latest developments in bio-inspired computation in image processing, focusing on nature-inspired algorithms that are linked with deep learning, such as ant colony optimization, particle swarm optimization, and bat and firefly algorithms that have recently emerged in the field. In addition to documenting state-of-the-art developments, this book also discusses future research trends in bio-inspired computation, helping researchers establish new research avenues to pursue. Reviews the latest developments in bio-inspired

computation in image processing Focuses on the introduction and analysis of the key bio-inspired methods and techniques Combines theory with real-world applications in image processing Helps solve complex problems in image and signal processing Contains a diverse range of self-contained case studies in real-world applications

Advances in Nature-Inspired Computing and Applications-Shishir Kumar Shandilya 2018-08-29 This book contains research contributions from leading global scholars in nature-inspired computing. It includes comprehensive coverage of each respective topic, while also highlighting recent and future trends. The contributions provides readers with a snapshot of the state of the art in the field of nature-inspired computing and its application. This book has focus on the current researches while highlighting the empirical results along with theoretical concepts to provide a comprehensive reference for students, researchers, scholars, professionals and practitioners in the field of Advanced Artificial Intelligence, Nature-Inspired Algorithms and Soft Computing.

Computational Intelligence in Data Mining—Volume 2-Himansu Sekhar Behera 2015-12-09 The book is a collection of high-quality peer-reviewed research papers presented in the Second International Conference on Computational Intelligence in Data Mining (ICCIDM 2015) held at Bhubaneswar, Odisha, India during 5 - 6 December 2015. The two-volume Proceedings address the difficulties and challenges for the seamless integration of two core disciplines of computer science, i.e., computational intelligence and data mining. The book addresses different methods and techniques of integration for enhancing the overall goal of data mining. The book helps to disseminate the knowledge about some innovative, active research directions in the field of data mining, machine and computational intelligence, along with some current issues and applications of related topics.

Bio-Inspired Computation in Telecommunications-Xin-She Yang 2015-02-11 Bio-inspired computation, especially those based on swarm intelligence, has become increasingly popular in the last decade. Bio-Inspired Computation in Telecommunications reviews the latest developments in bio-inspired computation from both theory and application as they relate to telecommunications and image processing, providing a complete resource that analyzes and discusses the latest and future trends in research directions. Written by recognized experts, this is a must-have guide for researchers, telecommunication engineers, computer scientists and PhD students.

Optimization in Control Applications-Guillermo Valencia-Palomo 2019-01-10 This book is a printed edition of the Special Issue "Optimization in Control Applications" that was published in MCA

Optimization for Robot Modelling with MATLAB-Hazim Nasir Ghafil 2020-02-28 This book addresses optimization in robotics, in terms of both the configuration space and the metal structure of the robot arm itself; and discusses, describes and builds different types of heuristics and algorithms in MATLAB. In addition, the book includes a wealth of examples and exercises. In particular, it enables the reader to write a MATLAB code for all the related problems in robotics. The book also offers detailed descriptions of and builds from scratch several types of optimization algorithms using MATLAB and simplified methods, especially for inverse problems and avoiding singularities. Each chapter features examples and exercises to enhance the reader's comprehension. Accordingly, the book offers the reader a better understanding of robot analysis from an optimization standpoint.

Evolutionary Optimization Algorithms-Dan Simon 2013-06-13 A clear and lucid bottom-up approach to the basic principles of evolutionary algorithms Evolutionary algorithms (EAs) are a type of artificial intelligence. EAs are motivated by optimization processes that we observe in nature, such as natural selection, species migration, bird swarms, human culture, and ant colonies. This book discusses the theory, history, mathematics, and programming of evolutionary optimization algorithms. Featured algorithms include genetic algorithms, genetic programming, ant colony optimization, particle swarm optimization, differential evolution, biogeography-based optimization, and many others. Evolutionary Optimization Algorithms: Provides a straightforward, bottom-up approach that assists the reader in obtaining a clear—but theoretically rigorous—understanding of evolutionary algorithms, with an emphasis on implementation Gives a careful treatment of recently developed EAs—including opposition-based learning, artificial fish swarms, bacterial foraging, and many others—and discusses their similarities and differences from more well-established EAs Includes chapter-end problems plus a solutions manual available online for instructors Offers simple examples that provide the reader with an intuitive understanding of the theory Features source code for the examples available on the author's website Provides advanced mathematical techniques for analyzing EAs, including Markov modeling and dynamic system modeling Evolutionary Optimization Algorithms: Biologically Inspired and Population-Based Approaches to Computer Intelligence is an ideal text for advanced undergraduate students, graduate students, and professionals involved in engineering and computer science.

Swarm Intelligence-Aboul Ella Hassanien 2018-09-03 Swarm Intelligence: Principles, Advances, and Applications delivers in-depth coverage of bat, artificial fish swarm, firefly, cuckoo search, flower pollination, artificial bee colony, wolf search, and gray wolf optimization algorithms. The book begins with a brief introduction to mathematical optimization, addressing basic concepts related to swarm intelligence, such as randomness, random walks, and chaos theory. The text then: Describes the various swarm intelligence optimization methods, standardizing the variants, hybridizations, and algorithms whenever possible Discusses variants that focus more on binary, discrete, constrained, adaptive, and chaotic versions of the swarm optimizers Depicts real-world applications of the individual optimizers, emphasizing variable selection and fitness function design Details the similarities, differences, weaknesses, and strengths of each swarm optimization method Draws parallels between the operators and searching manners of the different algorithms Swarm Intelligence: Principles, Advances, and Applications presents a comprehensive treatment of modern swarm intelligence optimization methods, complete with illustrative examples and an extendable MATLAB® package for feature selection in wrapper mode applied on different data sets with benchmarking using different evaluation criteria. The book provides beginners with a solid foundation of swarm intelligence fundamentals, and offers experts valuable insight into new directions and hybridizations.

Computational Intelligence Paradigms-S. PANERSELVAM SUMATHI (SUREKHA.) 2019-08-30 Offering a wide range of programming examples implemented in MATLAB(R), Computational Intelligence Paradigms: Theory and Applications Using MATLAB(R) presents theoretical concepts and a general framework for computational intelligence (CI) approaches, including artificial neural networks, fuzzy systems, evolutionary computation, genetic algorithms and programming, and swarm intelligence. It covers numerous intelligent computing methodologies and algorithms used in CI research. The book first focuses on neural networks, including common artificial neural networks; neural networks based on data classification, data association, and data conceptualization; and real-world applications of neural networks. It then discusses fuzzy sets, fuzzy rules, applications of fuzzy systems, and different types of fused neuro-fuzzy systems, before providing MATLAB illustrations of ANFIS, classification and regression trees, fuzzy c-means clustering algorithms, fuzzy ART map, and Takagi-Sugeno inference systems. The authors also describe the history, advantages, and disadvantages of evolutionary computation and include solved MATLAB programs to illustrate the implementation of evolutionary computation in various problems. After exploring the operators and parameters of genetic algorithms, they cover the steps and MATLAB routines of genetic programming. The final chapter introduces swarm intelligence and its applications, particle swarm optimization, and ant colony optimization. Full of worked examples and end-of-chapter questions, this comprehensive book explains how to use MATLAB to implement CI techniques for the solution of biological problems. It will help readers with their work on evolution dynamics, self-organization, natural and artificial morphogenesis, emergent collective behaviors, swarm intelligence, evolutionary strategies, genetic programming, and the evolution of social behaviors.

Engineering Optimization 2014-Hélder Rodrigues 2014-09-26 Optimization methodologies are fundamental instruments to tackle the complexity of today's engineering processes. Engineering Optimization 2014 is dedicated to optimization methods in engineering, and contains the papers presented at the 4th International Conference on Engineering Optimization (ENGOPT2014, Lisbon, Portugal, 8-11 September 2014). The book will be of interest to engineers, applied mathematicians, and computer scientists working on research, development and practical applications of optimization methods in engineering.

Bioinspired Optimization Methods and Their Applications-Peter Korošec 2018-05-11 This book constitutes the thoroughly refereed revised selected papers of the 10th International Conference on Bioinspired Optimization Models and Their Applications, BIOMA 2018, held in Paris, France, in May 2018. The 27 revised full papers were selected from 53 submissions and present papers in all aspects of bioinspired optimization research such as new algorithmic developments, high-impact applications, new research challenges, theoretical contributions, implementation issues, and experimental studies.

Engineering Optimization-S. S. Rao 2000 A Rigorous Mathematical Approach To Identifying A Set Of Design Alternatives And Selecting The Best Candidate From Within That Set, Engineering Optimization Was Developed As A Means Of Helping Engineers To Design Systems That Are Both More Efficient And Less Expensive And To Develop New Ways Of Improving The Performance Of Existing Systems.Thanks To The Breathtaking Growth In Computer Technology That Has Occurred Over The Past Decade, Optimization Techniques Can Now Be Used To Find Creative Solutions To Larger, More Complex Problems Than Ever Before. As A Consequence, Optimization Is Now Viewed As An Indispensable Tool Of The Trade For Engineers Working In Many Different Industries, Especially The Aerospace, Automotive, Chemical, Electrical, And Manufacturing Industries.In Engineering Optimization, Professor Singiresu S. Rao Provides An Application-Oriented Presentation Of The Full Array Of Classical And Newly Developed Optimization Techniques Now Being Used By Engineers In A Wide Range Of Industries. Essential Proofs And Explanations Of The Various Techniques Are Given In A Straightforward, User-Friendly Manner, And Each Method Is Copiously Illustrated With Real-World Examples That Demonstrate How To Maximize Desired Benefits While Minimizing Negative Aspects Of Project Design.Comprehensive, Authoritative, Up-To-Date, Engineering Optimization Provides In-Depth Coverage Of Linear And Nonlinear Programming, Dynamic Programming, Integer Programming, And Stochastic Programming Techniques As Well As Several Breakthrough Methods, Including Genetic Algorithms, Simulated Annealing, And Neural Network-Based And Fuzzy Optimization Techniques.Designed To Function Equally Well As Either A Professional Reference Or A Graduate-Level Text, Engineering Optimization Features Many Solved Problems Taken From Several Engineering Fields, As Well As Review Questions, Important Figures, And Helpful References.Engineering Optimization Is A Valuable Working Resource For Engineers Employed In Practically All Technological Industries. It Is Also A Superior Didactic Tool For Graduate Students Of Mechanical, Civil, Electrical, Chemical And Aerospace Engineering.

Genetic Algorithms in Electromagnetics-Randy L. Haupt 2007-04-27 A thorough and insightful introduction to using genetic algorithms to optimize electromagnetic systems Genetic Algorithms in Electromagnetics focuses on optimizing the objective function when a computer algorithm, analytical model, or experimental result describes the performance of an electromagnetic system. It offers expert guidance to optimizing electromagnetic systems using genetic algorithms (GA), which have proven to be tenacious in finding optimal results where traditional techniques fail. Genetic Algorithms in Electromagnetics begins with an introduction to optimization and several commonly used numerical optimization routines, and goes on to feature: Introductions to GA in both binary and continuous variable forms, complete with examples of MATLAB(r) commands Two step-by-step examples of optimizing antenna arrays as well as a comprehensive overview of applications of GA to antenna array design problems Coverage of GA as an adaptive algorithm, including adaptive and smart arrays as well as adaptive reflectors and crossed dipoles Explanations of the optimization of several different wire antennas, starting with the famous "crooked monopole" How to optimize horn, reflector, and microstrip patch antennas, which require significantly more computing power than wire antennas Coverage of GA optimization of scattering, including scattering from frequency selective surfaces and electromagnetic band gap materials Ideas on operator and parameter selection for a GA Detailed explanations of particle swarm optimization and multiple objective optimization An appendix of MATLAB code for experimentation

Advances in Structural and Multidisciplinary Optimization-Axel Schumacher 2017-12-04 The volume includes papers from the WSCMO conference in Braunschweig 2017 presenting research of all aspects of the optimal design of structures as well as multidisciplinary design optimization where the involved disciplines deal with the analysis of solids, fluids or other field problems. Also presented are practical applications of optimization methods and the corresponding software development in all branches of technology.

Software-Defined Radio for Engineers-Alexander M. Wyglinski 2018-04-30 Based on the popular Artech House classic, Digital Communication Systems Engineering with Software-Defined Radio, this book provides a practical approach to quickly learning the software-defined radio (SDR) concepts needed for work in the field. This up-to-date volume guides readers on how to quickly prototype wireless designs using SDR for real-world testing and experimentation. This book explores advanced wireless communication techniques such as OFDM, LTE, WLA, and hardware targeting. Readers will gain an understanding of the core concepts behind wireless hardware, such as the radio frequency front-end, analog-to-digital and digital-to-analog converters, as well as various processing technologies. Moreover, this volume includes chapters on timing estimation, matched filtering, frame synchronization message decoding, and source coding. The orthogonal frequency division multiplexing is explained and details about HDL code generation and deployment are provided. The book concludes with coverage of the WLAN toolbox with OFDM beacon reception and the LTE toolbox with downlink reception. Multiple case studies are provided throughout the book. Both MATLAB and Simulink source code are included to assist readers with their projects in the field.

Nature-Inspired Computation and Swarm Intelligence-Xin-She Yang 2020-04-24 Nature-inspired computation and swarm intelligence have become popular and effective tools for solving problems in optimization, computational intelligence, soft computing and data science. Recently, the literature in the field has expanded rapidly, with new algorithms and applications emerging. Nature-Inspired Computation and Swarm Intelligence: Algorithms, Theory and Applications is a timely reference giving a comprehensive review of relevant state-of-the-art developments in algorithms, theory and applications of nature-inspired algorithms and swarm intelligence. It reviews and documents the new developments, focusing on nature-inspired algorithms and their theoretical analysis, as well as providing a guide to their implementation. The book includes case studies of diverse real-world applications, balancing explanation of the theory with practical implementation. Nature-Inspired Computation and Swarm Intelligence: Algorithms, Theory and Applications is suitable for researchers and graduate students in computer science, engineering, data science, and management science, who want a comprehensive review of algorithms, theory and implementation within the fields of nature inspired computation and swarm intelligence. Introduces nature-inspired algorithms and their fundamentals, including: particle swarm optimization, bat algorithm, cuckoo search, firefly algorithm, flower pollination algorithm, differential evolution and genetic algorithms as well as multi-objective optimization algorithms and others Provides a theoretical foundation and analyses of algorithms, including: statistical theory and Markov chain theory on the convergence and stability of algorithms, dynamical system theory, benchmarking of optimization, no-free-lunch theorems, and a generalized mathematical framework Includes a diversity of case studies of real-world applications: feature selection, clustering and classification, tuning of restricted Boltzmann machines, travelling salesman problem, classification of white blood cells, music generation by artificial intelligence, swarm robots, neural networks, engineering designs and others

Handbook of Global Optimization-R. Horst 2013-12-11 Global optimization is concerned with the computation and characterization of global optima of nonlinear functions. During the past three decades the field of global optimization has been growing at a rapid pace, and the number of publications on all aspects of global optimization has been increasing steadily. Many applications, as well as new theoretical, algorithmic, and computational contributions have resulted. The Handbook of Global Optimization is the first comprehensive book to cover recent developments in global optimization. Each contribution in the Handbook is essentially expository in nature, but scholarly in its treatment. The chapters cover optimality conditions, complexity results, concave minimization, DC programming, general quadratic programming, nonlinear complementarity, minimax problems, multiplicative programming, Lipschitz optimization, fractional programming, network problems, trajectory methods, homotopy methods, interval methods, and stochastic approaches. The Handbook of Global Optimization is addressed to researchers in mathematical programming, as well as all scientists who use optimization methods to model and solve problems.

Nature Inspired Optimization Techniques for Image Processing Applications-Jude Hemanth 2018-09-19 This book provides a platform for exploring nature-inspired optimization techniques in the context of imaging applications. Optimization has become part and parcel of all computational vision applications, and since the amount of data used in these applications is vast, the need for optimization techniques has increased exponentially. These accuracy and complexity are a major area of concern when it comes to practical applications. However, these optimization techniques have not yet been fully explored in the context of imaging applications. By presenting interdisciplinary concepts, ranging from optimization to image processing, the book appeals to a broad readership, while also encouraging budding engineers to pursue and employ innovative nature-inspired techniques for image processing applications.

Applied Nature-Inspired Computing: Algorithms and Case Studies-Nilanjana Dey 2019-08-10 This book presents a cutting-edge research procedure in the Nature-Inspired Computing (NIC) domain and its connections with computational intelligence areas in real-world engineering applications. It introduces readers to a broad range of algorithms, such as genetic algorithms, particle swarm optimization, the firefly algorithm, flower pollination algorithm, collision-based optimization algorithm, bat algorithm, ant colony optimization, and multi-agent systems. In turn, it provides an overview of meta-heuristic algorithms, comparing the advantages and disadvantages of each. Moreover, the book provides a brief outline of the integration of nature-inspired computing techniques and various computational intelligence paradigms, and highlights nature-inspired computing techniques in a range of applications, including: evolutionary robotics, sports training planning, assessment of water distribution systems, flood simulation and forecasting, traffic control, gene expression analysis, antenna array design, and scheduling/dynamic resource management.

Harmony Search and Nature Inspired Optimization Algorithms-Neha Yadav 2018-08-23 The book covers different aspects of real-world applications of optimization algorithms. It provides insights from the Fourth International Conference on Harmony Search, Soft Computing and Applications held at BML Munjal University, Gurgaon, India on February 7-9, 2018. It consists of research articles on novel and newly proposed optimization algorithms; the theoretical study of nature-inspired optimization algorithms; numerically established results of nature-inspired optimization algorithms; and real-world applications of optimization algorithms and synthetic benchmarking of optimization algorithms.

Genetic Algorithms + Data Structures = Evolution Programs-Zbigniew Michalewicz 2013-03-09 Genetic algorithms are founded upon the principle of evolution, i.e., survival of the fittest. Hence evolution programming techniques, based on genetic algorithms, are applicable to many hard optimization problems, such as optimization of functions with linear and nonlinear constraints, the traveling salesman problem, and problems of scheduling, partitioning, and control. The importance of these techniques is still growing, since evolution programs are parallel in nature, and parallelism is one of the most promising directions in computer science. The book is self-contained and the only prerequisite is basic undergraduate mathematics. This third edition has been substantially revised and extended by three new chapters and by additional appendices containing working material to cover recent developments and a change in the perception of evolutionary computation.

Algorithms For Dummies-John Paul Mueller 2017-04-11 Discover how algorithms shape and impact our digital world All data, big or small, starts with algorithms. Algorithms are mathematical equations that determine what we see—based on our likes, dislikes, queries, views, interests, relationships, and more—online. They are, in a sense, the electronic gatekeepers to our digital, as well as our physical, world. This book demystifies the subject of algorithms so you can understand how important they are to business and scientific decision making. Algorithms for Dummies is a clear and concise primer for everyday people who are interested in algorithms and how they impact our digital lives. Based on the fact that we already live in a world where algorithms are behind most of the technology we use, this book offers eye-opening information on the pervasiveness and importance of this mathematical science—how it plays out in our everyday digestion of news and entertainment, as well as in its influence on our social interactions and consumerism. Readers even learn how to program an algorithm using Python! Become well-versed in the major areas comprising algorithms Examine the incredible history behind algorithms Get familiar with real-world applications of problem-solving procedures Experience hands-on development of an algorithm from start to finish with Python If you have a nagging curiosity about why an ad for that hammock you checked out on Amazon is appearing on your Facebook page, you'll find Algorithms for Dummies to be an enlightening introduction to this integral realm of math, science, and business.

Fault Diagnosis Inverse Problems: Solution with Metaheuristics-Lidice Camps Echevarria 2018-05-28 This book presents a methodology based on inverse problems for use in solutions for fault diagnosis in control systems, combining tools from mathematics, physics, computational and mathematical modeling, optimization and computational intelligence. This methodology, known as fault diagnosis - inverse problem methodology or FD-IPM, unifies the results of

several years of work of the authors in the fields of fault detection and isolation (FDI), inverse problems and optimization. The book clearly and systematically presents the main ideas, concepts and results obtained in recent years. By formulating fault diagnosis as an inverse problem, and by solving it using metaheuristics, the authors offer researchers and students a fresh, interdisciplinary perspective for problem solving in these fields. Graduate courses in engineering, applied mathematics and computing also benefit from this work.

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