

Access Free Nature Inspired Optimization Algorithms Pdf Free Copy

Nature Inspired Optimization for Electrical Power System Oct 09 2021 This book presents a wide range of optimization methods and their applications to various electrical power system problems such as economical load dispatch, demand supply management in microgrids, leveled energy pricing, load frequency control and congestion management, and reactive power management in radial distribution systems. Problems related to electrical power systems are often highly complex due to the massive dimensions, nonlinearity, non-convexity and discontinuity associated with objective functions. These systems also have a large number of equality and inequality constraints, which give rise to optimization problems that are difficult to solve using classical numerical methods. In this regard, nature inspired optimization algorithms offer an effective alternative, due to their ease of use, population-based parallel search mechanism, non-dependence on the nature of the problem, and ability to accommodate non-differentiable, non-convex problems. The analytical model of nature inspired techniques mimics the natural behaviors and intelligence of life forms. These techniques are mainly based on evolution, swarm intelligence, ecology, human intelligence and physical science.

Evolutionary Optimization Algorithms Dec 11 2021 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.

Harmony Search and Nature Inspired Optimization Algorithms Apr 14 2022 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.

Nature-Inspired Optimization Algorithms Aug 31 2023 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

Clever Algorithms Jun 04 2021 This book provides a handbook of algorithmic recipes from the fields of Metaheuristics, Biologically Inspired Computation and Computational Intelligence that have been described in a complete, consistent, and centralized manner. These standardized descriptions were carefully designed to be accessible, usable, and understandable. Most of the algorithms described in this book were originally inspired by biological and natural systems, such as the adaptive capabilities of genetic evolution and the acquired immune system, and the foraging behaviors of birds, bees, ants and bacteria. An encyclopedic algorithm reference, this book is intended for research scientists, engineers, students, and interested amateurs. Each algorithm description provides a working code example in the Ruby Programming Language.

Nature-Inspired Optimization Algorithms Feb 22 2023 This book will focus on the involvement of data mining and intelligent computing methods for recent advances in Biomedical applications and algorithms of nature-inspired computing for Biomedical systems. The proposed meta heuristic or nature-inspired techniques should be an enhanced, hybrid, adaptive or improved version of basic algorithms in terms of performance and convergence metrics. In this exciting and emerging interdisciplinary area a wide range of theory and methodologies are being investigated and developed to tackle complex and challenging problems. Today, analysis and processing of data is one of big focuses among researchers community and information society. Due to evolution and knowledge discovery of natural computing, related meta heuristic or bio-inspired algorithms have gained increasing popularity in the recent decade because of their significant potential to tackle computationally intractable optimization dilemma in medical, engineering, military, space and industry fields. The main reason behind the success rate of nature inspired algorithms is their capability to solve problems. The nature inspired optimization techniques provide adaptive computational tools for the complex optimization problems and diversified engineering applications. Tentative Table of Contents/Topic Coverage: - Neural Computation - Evolutionary Computing Methods - Neuroscience driven AI Inspired Algorithms - Biological System based algorithms - Hybrid and Intelligent Computing Algorithms - Application of Natural Computing - Review and State of art analysis of Optimization algorithms - Molecular and Quantum computing applications - Swarm Intelligence - Population based algorithm and other optimizations

Socio-Inspired Optimization Methods for Advanced Manufacturing Processes Jul 26 2020 This book discusses comprehensively the advanced manufacturing processes, including illustrative examples of the processes, mathematical modeling, and the need to optimize associated parameter problems. In addition, it describes in detail the cohort intelligence methodology and its variants along with illustrations, to help readers gain a better understanding of the framework. The theoretical and statistical rigor is validated by comparing the solutions with evolutionary algorithms, simulation annealing, response surface methodology, the firefly algorithm, and experimental work. Lastly, the book critically reviews several socio-inspired optimization methods.

Bio-Inspired Algorithms for Engineering Jul 06 2021 Bio-inspired Algorithms for Engineering builds a bridge between the proposed bio-inspired algorithms developed in the past few decades and their applications in real-life problems, not only in an academic context, but also in the real world. The book proposes novel algorithms to solve real-life, complex problems, combining well-known bio-inspired algorithms with new concepts, including both rigorous analyses and unique applications. It covers both theoretical and practical methodologies, allowing readers to learn more about the implementation of bio-inspired algorithms. This book is a useful resource for both academic and industrial engineers working on artificial intelligence, robotics, machine learning, vision, classification, pattern recognition, identification and control. Presents real-time implementation and simulation results for all the proposed schemes Offers a comparative analysis and rigorous analysis of the convergence of proposed algorithms Provides a guide for implementing each application at the end of each chapter Includes illustrations, tables and figures that facilitate the reader's comprehension of the proposed schemes and applications

Nature-inspired Metaheuristic Algorithms Jun 28 2023 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.

Modern Music-Inspired Optimization Algorithms for Electric Power Systems Mar 02 2021 In today's world, with an increase in the breadth and scope of real-world engineering optimization problems as well as with the advent of big data, improving the performance and efficiency of algorithms for solving such problems has become an indispensable need for specialists and researchers. In contrast to conventional books in the field that employ traditional single-stage computational, single-dimensional, and single-homogeneous optimization algorithms, this book addresses multiple newfound architectures for meta-heuristic music-inspired optimization algorithms. These proposed algorithms, with multi-stage computational, multi-dimensional, and multi-inhomogeneous structures, bring about a new direction in the architecture of meta-heuristic algorithms for solving complicated, real-world, large-scale, non-convex, non-smooth engineering optimization problems having a non-linear, mixed-integer nature with big data. The architectures of these new algorithms may also be appropriate for finding an optimal solution or a Pareto-optimal solution set with higher accuracy and speed in comparison to other optimization algorithms, when feasible regions of the solution space and/or dimensions of the optimization problem increase. This book, unlike conventional books on power systems problems that only consider simple and impractical models, deals with complicated, techno-economic, real-world, large-scale models of power systems operation and planning. Innovative applicable ideas in these models make this book a precious resource for specialists and researchers with a background in power systems operation and planning. Provides an understanding of the optimization problems and algorithms, particularly meta-heuristic optimization algorithms, found in fields such as engineering, economics, management, and operations research; Enhances existing architectures and develops innovative architectures for meta-heuristic music-inspired optimization algorithms in order to deal with complicated, real-world, large-scale, non-convex, non-smooth engineering optimization problems having a non-linear, mixed-integer nature with big data; Addresses innovative multi-level, techno-economic, real-world, large-scale, computational-logical frameworks for power systems operation and planning, and illustrates practical training on implementation of the frameworks using the meta-heuristic music-inspired optimization algorithms.

Foraging-Inspired Optimisation Algorithms Mar 14 2022 This book is an introduction to relevant aspects of the foraging literature for algorithmic design, and an overview of key families of optimization algorithms that stem from a foraging metaphor. The authors first offer perspectives on foraging and foraging-inspired algorithms for optimization, they then explain the techniques inspired by the behaviors of vertebrates, invertebrates, and non-neuronal organisms, and they then discuss algorithms based on formal models of foraging, how to evolve a foraging strategy, and likely future developments. No prior knowledge of natural computing is assumed. This book will be of particular interest to graduate students, academics and practitioners in computer science, informatics, data science, management science, and other application domains.

Nature-Inspired Optimization Algorithms Apr 02 2021 This book will focus on the involvement of data mining and intelligent computing methods for recent advances in Biomedical applications and algorithms of nature-inspired computing for Biomedical systems. The proposed meta heuristic or nature-inspired techniques should be an enhanced, hybrid, adaptive or improved version of basic algorithms in terms of performance and convergence metrics. In this exciting and emerging interdisciplinary area a wide range of theory and methodologies are being investigated and developed to tackle complex and challenging problems. Today, analysis and processing of data is one of big focuses among researchers community and information society. Due to evolution and knowledge discovery of natural computing, related meta heuristic or bio-inspired algorithms have gained increasing popularity in the recent decade because of their significant potential to tackle computationally intractable optimization dilemma in medical, engineering, military, space and industry fields. The main reason behind the success rate of nature inspired algorithms is their capability to solve problems. The nature inspired optimization techniques provide adaptive computational tools for the complex optimization problems and diversified engineering applications. Tentative Table of Contents/Topic Coverage: - Neural Computation - Evolutionary Computing Methods - Neuroscience driven AI Inspired Algorithms - Biological System based algorithms - Hybrid and Intelligent Computing Algorithms - Application of Natural Computing - Review and State of art analysis of Optimization algorithms - Molecular and Quantum computing applications - Swarm Intelligence - Population based algorithm and other optimizations

Nature-Inspired Optimization Algorithms with Java Apr 26 2023 Gain insight into the world of nature-inspired optimization techniques and algorithms. This book will prepare you to apply different nature-inspired optimization techniques to solve problems using Java. You'll start with an introduction to the hidden algorithms that nature uses and find the approximate solutions to optimization problems. You'll then see how living creatures such as fish and birds are able to perform computation to solve specific optimization tasks. This book also covers various nature-inspired algorithms by reviewing code examples for each one followed by crisp and clear explanations of the algorithm using Java code. You'll examine the use of each algorithm in specific industry scenarios such as fleet scheduling in supply chain management, and shop floor management in industrial and manufacturing applications. Nature-Inspired Optimization Algorithms with Java is your pathway to understanding a variety of optimization problems that exist in various industries and domains and it will develop an ability to apply nature-inspired algorithms to find approximate solutions to them. What You'll Learn Study optimization and its problems Examine nature-inspired algorithms such as Particle Swarm, Gray wolf, etc. See how nature-inspired algorithms are being used to solve optimization problems Use Java for solving the different nature-inspired algorithms with real-world examples Who This Book Is For Software developers/architects who are looking to hone their skills in area of problem solving related to optimization with Java.

Deep Learning Techniques and Optimization Strategies in Big Data Analytics Jun 24 2020 Many approaches have sprouted from artificial intelligence (AI) and produced major breakthroughs in the computer science and engineering industries. Deep learning is a method that is transforming the world of data and analytics. Optimization of this new approach is still unclear, however, and there's a need for research on the various applications and techniques of deep learning in the field of computing. Deep Learning Techniques and Optimization Strategies in Big Data Analytics is a collection of innovative research on the methods and applications of deep learning strategies in the fields of computer science and information systems. While highlighting topics including data integration, computational modeling, and scheduling systems, this book is ideally designed for engineers, IT specialists, data analysts, data scientists, engineers, researchers, academicians, and students seeking current research on deep learning methods and its application in the digital industry.

Handbook of Research on Soft Computing and Nature-Inspired Algorithms Aug 26 2020 Soft computing and nature-inspired computing both play a significant role in developing a better understanding to machine learning. When studied together, they can offer new perspectives on the learning process of machines. The Handbook of Research on Soft Computing and Nature-Inspired Algorithms is an essential source for the latest scholarly research on applications of nature-inspired computing and soft computational systems. Featuring comprehensive coverage on a range of topics and perspectives such as swarm intelligence, speech recognition, and electromagnetic problem solving, this publication is ideally designed for students, researchers, scholars, professionals, and practitioners seeking current research on the advanced workings of intelligence in computing systems.

Biologically-Inspired Optimisation Methods Jan 29 2021 This book covers the latest theories, applications and techniques in Biologically-Inspired Optimisation Methods. Many chapters derive from studies presented at workshops and international conferences on e-Science, Grid Computing and Evolutionary computation.

Harmony Search Algorithm Nov 29 2020 The Harmony Search Algorithm (HSA) is one of the most well-known techniques in the field of soft computing, an important paradigm in the science and engineering community. This volume, the proceedings of the 2nd International Conference on Harmony Search Algorithm 2015 (ICHSA 2015), brings together contributions describing the latest developments in the field of soft computing with a special focus on HSA techniques. It includes coverage of new methods that have potentially immense application in various fields. Contributed articles cover aspects of the following topics related to the Harmony Search Algorithm: analytical studies; improved, hybrid and multi-objective variants; parameter tuning; and large-scale applications. The book also contains papers discussing recent advances on the following topics: genetic algorithms; evolutionary strategies; the firefly algorithm and cuckoo search; particle swarm optimization and ant colony optimization; simulated annealing; and local search techniques. This book offers a valuable snapshot of the current status of the Harmony Search Algorithm and related techniques, and will be a useful reference for practising researchers and advanced students in computer science and engineering.

Nature-Inspired Computing and Optimization Jul 18 2022 The book provides readers with a snapshot of the state of the art in the field of nature-inspired computing and its application in optimization. The approach is mainly practice-oriented: each bio-inspired technique or algorithm is introduced together with one of its possible applications. Applications cover a wide range of real-world optimization problems: from feature selection and image enhancement to scheduling and dynamic resource management, from wireless sensor networks and wiring network diagnosis to sports training planning and gene expression, from topology control and morphological filters to nutritional meal design and antenna array design. There are a few theoretical chapters comparing different existing techniques, exploring the advantages of nature-inspired computing over other methods, and investigating the mixing time of genetic algorithms. The book also introduces a wide range of algorithms, including the ant colony optimization, the bat algorithm, genetic algorithms, the collision-based optimization algorithm, the flower pollination algorithm, multi-agent systems and particle swarm optimization. This timely book is intended as a practice-oriented reference guide for students, researchers and professionals.

Nature-Inspired Optimization Algorithms for Fuzzy Controlled Servo Systems Oct 21 2022 Nature-inspired Optimization Algorithms for Fuzzy Controlled Servo Systems suits the general need of a book that explains the major issues to fuzzy control in servo systems without any solid mathematical prerequisite. In addition, pertinent information on nature-inspired optimization algorithms is offered. The book is intended to rapidly make intelligible notions of fuzzy set

theory and fuzzy control to readers with limited experience. The attractive analysis and design methodologies dedicated to fuzzy controllers are accompanied by applications to servo systems and case studies in fuzzy controlled servo systems are organized in a special chapter of this book, and allow simple implementations of low-cost automation solutions. The theoretical approaches presented throughout the book are validated by the illustration of digital simulation results and real-time experimental results as well. This book aims at a large category of audience including graduate students, engineers (designers, practitioners and researchers), and everyone who faces challenging control problems. Gives a merge between classical and modern approaches to fuzzy control Presents in a unified structure from the point of view of a control engineer the essential aspects regarding fuzzy control in servo systems Makes intelligible notions of fuzzy set theory and fuzzy control to readers with limited experience

Nature-Inspired Optimizers Jan 12 2022 This book covers the conventional and most recent theories and applications in the area of evolutionary algorithms, swarm intelligence, and meta-heuristics. Each chapter offers a comprehensive description of a specific algorithm, from the mathematical model to its practical application. Different kind of optimization problems are solved in this book, including those related to path planning, image processing, hand gesture detection, among others. All in all, the book offers a tutorial on how to design, adapt, and evaluate evolutionary algorithms. Source codes for most of the proposed techniques have been included as supplementary materials on a dedicated webpage.

Nature-Inspired Algorithms and Applications May 04 2021 NATURE-INSPIRED ALGORITHMS AND APPLICATIONS The book's unified approach of balancing algorithm introduction, theoretical background and practical implementation, complements extensive literature with well-chosen case studies to illustrate how these algorithms work. Inspired by the world around them, researchers are gathering information that can be developed for use in areas where certain practical applications of nature-inspired computation and machine learning can be applied. This book is designed to enhance the reader's understanding of this process by portraying certain practical applications of nature-inspired algorithms (NIAs) specifically designed to solve complex real-world problems in data analytics and pattern recognition by means of domain-specific solutions. Since various NIAs and their multidisciplinary applications in the mechanical engineering and electrical engineering sectors; and in machine learning, image processing, data mining, and wireless networks are dealt with in detail in this book, it can act as a handy reference guide. Among the subjects of the 12 chapters are: A novel method based on TRIZ to map real-world problems to nature problems Applications of cuckoo search algorithm for optimization problems Performance analysis of nature-inspired algorithms in breast cancer diagnosis Nature-inspired computation in data mining Hybrid bat-genetic algorithm-based novel optimal wavelet filter for compression of image data Efficiency of finding best solutions through ant colony optimization techniques Applications of hybridized algorithms and novel algorithms in the field of machine learning. Audience: Researchers and graduate students in mechanical engineering, electrical engineering, machine learning, image processing, data mining, and wireless networks will find this book very useful.

Discrete Problems in Nature Inspired Algorithms Sep 27 2020 This book includes introduction of several algorithms which are exclusively for graph based problems, namely combinatorial optimization problems, path formation problems, etc. Each chapter includes the introduction of the basic traditional nature inspired algorithm and discussion of the modified version for discrete algorithms including problems pertaining to discussed algorithms.

Nature Inspired Optimization Techniques for Image Processing Applications Sep 07 2021 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.

Nature-Inspired Optimization Algorithms Feb 10 2022 Nature-Inspired Optimization Algorithms, a comprehensive work on the most popular optimization algorithms based on nature, starts with an overview of optimization going from the classical to the latest swarm intelligence algorithm. Nature has a rich abundance of flora and fauna that inspired the development of optimization techniques, providing us with simple solutions to complex problems in an effective and adaptive manner. The study of the intelligent survival strategies of animals, birds, and insects in a hostile and ever-changing environment has led to the development of techniques emulating their behavior. This book is a lucid description of fifteen important existing optimization algorithms based on swarm intelligence and superior in performance. It is a valuable resource for engineers, researchers, faculty, and students who are devising optimum solutions to any type of problem ranging from computer science to economics and covering diverse areas that require maximizing output and minimizing resources. This is the crux of all optimization algorithms. Features: Detailed description of the algorithms along with pseudocode and flowchart Easy translation to program code that is also readily available in Mathworks website for some of the algorithms Simple examples demonstrating the optimization strategies are provided to enhance understanding Standard applications and benchmark datasets for testing and validating the algorithms are included This book is a reference for undergraduate and post-graduate students. It will be useful to faculty members teaching optimization. It is also a comprehensive guide for researchers who are looking for optimizing resources in attaining the best solution to a problem. The nature-inspired optimization algorithms are unconventional, and this makes them more efficient than their traditional counterparts.

Nature-inspired Optimization Algorithms Aug 19 2022

Biologically Inspired Optimization Methods Jan 24 2023 Biologically inspired optimization methods constitute a rapidly expanding field of research, with new applications appearing on an almost daily basis, as optimization problems of ever-increasing complexity appear in science and technology. This book provides a general introduction to such optimization methods, along with descriptions of the biological systems upon which the methods are based. The book also covers classical optimization methods, making it possible for the reader to determine whether a classical optimization method or a biologically inspired one is most suitable for a given problem.

Metaheuristic Optimization: Nature-Inspired Algorithms Swarm and Computational Intelligence, Theory and Applications Nov 21 2022 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.

Nature-Inspired Methods for Metaheuristics Optimization Dec 23 2022 This book gathers together a set of chapters covering recent development in optimization methods that are inspired by nature. The first group of chapters describes in detail different meta-heuristic algorithms, and shows their applicability using some test or real-world problems. The second part of the book is especially focused on advanced applications and case studies. They span different engineering fields, including mechanical, electrical and civil engineering, and earth/environmental science, and covers topics such as robotics, water management, process optimization, among others. The book covers both basic concepts and advanced issues, offering a timely introduction to nature-inspired optimization method for newcomers and students, and a source of inspiration as well as important practical insights to engineers and researchers.

Search and Optimization by Metaheuristics Nov 09 2021 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.

A New Bio-inspired Optimization Algorithm Based on the Self-defense Mechanism of Plants in Nature Dec 31 2020 This book presents a new meta-heuristic algorithm, inspired by the self-defense mechanisms of plants in

nature. Numerous published works have demonstrated the various self-defense mechanisms (survival strategies) plants use to protect themselves against predatory organisms, such as herbivorous insects. The proposed algorithm is based on the predator-prey mathematical model originally proposed by Lotka and Volterra, consisting of two nonlinear first-order differential equations, which allow the growth of two interacting populations (prey and predator) to be modeled. The proposed meta-heuristic is able to produce excellent results in several sets of benchmark optimization problems. Further, fuzzy logic is used for dynamic parameter adaptation in the algorithm.

Nature-Inspired Algorithms and Applied Optimization Mar 26 2023 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.

Nature-inspired Methods for Stochastic, Robust and Dynamic Optimization May 23 2020 Nature-inspired algorithms have a great popularity in the current scientific community, being the focused scope of many research contributions in the literature year by year. The rationale behind the acquired momentum by this broad family of methods lies on their outstanding performance evinced in hundreds of research fields and problem instances. This book gravitates on the development of nature-inspired methods and their application to stochastic, dynamic and robust optimization. Topics covered by this book include the design and development of evolutionary algorithms, bio-inspired metaheuristics, or memetic methods, with empirical, innovative findings when used in different subfields of mathematical optimization, such as stochastic, dynamic, multimodal and robust optimization, as well as noisy optimization and dynamic and constraint satisfaction problems.

Mathematical Foundations of Nature-Inspired Algorithms Jun 16 2022 This book presents a systematic approach to analyze nature-inspired algorithms. Beginning with an introduction to optimization methods and algorithms, this book moves on to provide a unified framework of mathematical analysis for convergence and stability. Specific nature-inspired algorithms include: swarm intelligence, ant colony optimization, particle swarm optimization, bee-inspired algorithms, bat algorithm, firefly algorithm, and cuckoo search. Algorithms are analyzed from a wide spectrum of theories and frameworks to offer insight to the main characteristics of algorithms and understand how and why they work for solving optimization problems. In-depth mathematical analyses are carried out for different perspectives, including complexity theory, fixed point theory, dynamical systems, self-organization, Bayesian framework, Markov chain framework, filter theory, statistical learning, and statistical measures. Students and researchers in optimization, operations research, artificial intelligence, data mining, machine learning, computer science, and management sciences will see the pros and cons of a variety of algorithms through detailed examples and a comparison of algorithms.

Advanced Optimization by Nature-Inspired Algorithms Jul 30 2023 This book, compiles, presents, and explains the most important meta-heuristic and evolutionary optimization algorithms whose successful performance has been proven in different fields of engineering, and it includes application of these algorithms to important engineering optimization problems. In addition, this book guides readers to studies that have implemented these algorithms by providing a literature review on developments and applications of each algorithm. This book is intended for students, but can be used by researchers and professionals in the area of engineering optimization.

Introduction to Nature-Inspired Optimization May 28 2023 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

Handbook of Nature-Inspired Optimization Algorithms: The State of the Art Aug 07 2021 The introduction of nature-inspired optimization algorithms (NIOAs), over the past three decades, helped solve nonlinear, high-dimensional, and complex computational optimization problems. NIOAs have been originally developed to overcome the challenges of global optimization problems such as nonlinearity, non-convexity, non-continuity, non-differentiability, and/or multimodality which traditional numerical optimization techniques had difficulties solving. The main objective for this book is to make available a self-contained collection of modern research addressing the general bound-constrained optimization problems in many real-world applications using nature-inspired optimization algorithms. This book is suitable for a graduate class on optimization, but will also be useful for interested senior students working on their research projects.

Handbook of Nature-Inspired Optimization Algorithms: The State of the Art Sep 19 2022 This book presents recent contributions and significant development, advanced issues, and challenges. In real-world problems and applications, most of the optimization problems involve different types of constraints. These problems are called constrained optimization problems (COPs). The optimization of the constrained optimization problems is considered a challenging task since the optimum solution(s) must be feasible. In their original design, evolutionary algorithms (EAs) are able to solve unconstrained optimization problems effectively. As a result, in the past decade, many researchers have developed a variety of constraint handling techniques, incorporated into (EAs) designs, to counter this deficiency. The main objective for this book is to make available a self-contained collection of modern research addressing the general constrained optimization problems in many real-world applications using nature-inspired optimization algorithms. This book is suitable for a graduate class on optimization, but will also be useful for interested senior students working on their research projects.

Bio-Inspired Algorithms in PID Controller Optimization May 16 2022 This book discusses in-depth role of optimization to optimize the controller parameters with reference to bio-inspired algorithms. Comparative studies to evaluate the performance of different optimization techniques in terms of the settling time, overshoot and undershoot responses of the frequency deviations, tie-line power flow deviations, and the area control error are included, supported by examples. The book also includes different scenarios of the load frequency controller for single area as well as multi-area thermal power generating unit considering different algorithms. Key Features: Highlights the importance of tuning the power system controller parameters with emphasis on bio-inspiration algorithms Provides some applied applications/examples of the thermal power system Focuses on power system applications based on the optimization algorithms with different single area and multi-area thermal power systems Reports different cases on the interconnected power systems with providing optimal performance by optimizing the controller's parameters

Nature-Inspired Optimization Algorithms for Fuzzy Controlled Servo Systems Oct 28 2020 Nature-inspired Optimization Algorithms for Fuzzy Controlled Servo Systems explains fuzzy control in servo systems in a way that doesn't require any solid mathematical prerequisite. Analysis and design methodologies are covered, along with specific applications to servo systems and representative case studies. The theoretical approaches presented throughout the book are validated by the illustration of digital simulation and real-time experimental results. This book is a great resource for a wide variety of readers, including graduate students, engineers (designers, practitioners and researchers), and everyone who faces challenging control problems. Merges classical and modern approaches to fuzzy control Presents, in a unified structure, the essential aspects regarding fuzzy control in servo systems Explains notions of fuzzy set theory and fuzzy control to readers with limited experience

Nature-Inspired Algorithms for Optimisation Apr 22 2020 Nature-Inspired Algorithms have been gaining much popularity in recent years due to the fact that many real-world optimisation problems have become increasingly large, complex and dynamic. The size and complexity of the problems nowadays require the development of methods and solutions whose efficiency is measured by their ability to find acceptable results within a reasonable amount of time, rather than an ability to guarantee the optimal solution. This volume 'Nature-Inspired Algorithms for Optimisation' is a collection of the latest state-of-the-art algorithms and important studies for tackling various kinds of optimisation problems. It comprises 18 chapters, including two introductory chapters which address the fundamental issues that have made optimisation problems difficult to solve and explain the rationale for seeking inspiration from nature. The contributions stand out through their novelty and clarity of the algorithmic descriptions and analyses, and lead the way to interesting and varied new applications.