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Fundamentals of Optimization Techniques with Algorithms
Nature-Inspired Computing Paradigms in Systems
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Nature-Inspired Metaheuristic Algorithms for Engineering Optimization Applications
Proceedings of International Conference on Robotics and Its Industrial Applications 2019
Nature-inspired Programming Recipes

HEZEKIAH POPE

Algorithms, Theory and Applications CRC Press
Clear and effective instruction on MADM methods for students, researchers, and practitioners. A Handbook on Multi-Attribute Decision-Making Methods describes multi-attribute decision-making (MADM) methods and provides step-by-step guidelines for applying them. The authors describe the most important MADM methods and provide an assessment of their performance in solving problems across disciplines. After offering an overview of decision-making

and its fundamental concepts, this book covers 20 leading MADM methods and contains an appendix on weight assignment methods. Chapters are arranged with optimal learning in mind, so you can easily engage with the content found in each chapter. Dedicated readers may go through the entire book to gain a deep understanding of MADM methods and their theoretical foundation, and others may choose to review only specific chapters. Each standalone chapter contains a brief description of prerequisite materials, methods, and mathematical concepts needed to cover its content, so you will not face any difficulty understanding single chapters. Each chapter: Describes, step-by-step, a specific MADM method, or in some cases a family of methods Contains a thorough literature review for each MADM method, supported with numerous examples of the method's implementation in various fields Provides a detailed yet concise description of each method's theoretical foundation Maps each method's philosophical basis to its corresponding mathematical framework Demonstrates how to implement each MADM method to real-world problems in a variety of disciplines In MADM methods, stakeholders' objectives are expressible through a set of often conflicting criteria, making this family of decision-making approaches relevant to a wide range of situations. A Handbook on Multi-Attribute Decision-Making Methods compiles and explains the most important methodologies in a clear and systematic

manner, perfect for students and professionals whose work involves operations research and decision making.

Nature Inspired Optimization for Electrical Power System Advanced Optimization by Nature-Inspired Algorithms

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.

Theory and Applications Academic Press

This book provides comprehensive details of all Swarm Intelligence based Techniques available till date in a comprehensive manner along with their mathematical proofs. It will act as a foundation for authors, researchers and industry professionals. This monograph will present the latest state of the art research being done on varied Intelligent Technologies like sensor networks, machine learning, optical fiber communications, digital signal processing, image processing and many more.

Techniques and Algorithms Inspired by Nature IGI Global
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.
A Handbook on Multi-Attribute Decision-Making Methods Springer
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, levelized 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.

Theory and Applications, ICHSA 2018

Walter de Gruyter GmbH & Co KG

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.

Theoretical Advances and Advanced

Applications Academic Press
This book addresses the frontier advances in the theory and application of nature-inspired optimization techniques, including solving the quadratic assignment problem, prediction in nature-inspired dynamic optimization, the lion algorithm and its applications, optimizing the operation scheduling of microgrids, PID controllers for two-legged robots, optimizing crane operating times, planning electrical energy distribution systems, automatic design and evaluation of classification pipelines, and optimizing wind-energy power generation plants. The book also presents a variety of nature-inspired methods and illustrates methods of adapting these to said applications. Nature-inspired computation, developed by mimicking natural phenomena, makes a significant contribution toward the solution of non-convex optimization problems that normal mathematical optimizers fail to solve. As such, a wide range of nature-inspired computing approaches has been used in multidisciplinary engineering applications. Written by researchers and developers from a variety of fields, this book presents the latest findings, novel techniques and pioneering applications.
Nature-Inspired Optimization Algorithms CRC Press
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 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

Frontier Applications of Nature Inspired Computation IGI Global

Advanced Optimization by Nature-Inspired AlgorithmsSpringer

Applications of Advanced Optimization Techniques in Industrial Engineering Springer

This book features high-quality research papers presented at the International Conference on Applications and Techniques in Cyber Security and Digital Forensics (ICCSDF 2021), held at The NorthCap University, Gurugram,

Haryana, India, during April 3–4, 2021. This book discusses the topics ranging from information security to cryptography, mobile application attacks to digital forensics, and from cyber security to blockchain. The goal of the book is to provide 360-degree view of cybersecurity to the readers which include cyber security issues, threats, vulnerabilities, novel idea, latest technique and technology, and mitigation of threats and attacks along with demonstration of practical applications. This book also highlights the latest development, challenges, methodologies as well as other emerging areas in this field. It brings current understanding of common Web vulnerabilities while maintaining awareness and knowledge of contemporary standards, practices, procedures, and methods of Open Web Application Security Project. It also expounds how to recover information after a cybercrime.

Applications of Robotics in Industry Using Advanced Mechanisms

Springer Nature

This book gravitates on the prominent theories and recent developments of swarm intelligence methods, and their application in both synthetic and real-world optimization problems. The special interest will be placed in those algorithmic variants where biological processes observed in nature have underpinned the core operators underlying their search mechanisms. In other words, the book centers its attention on swarm intelligence and

nature-inspired methods for efficient optimization and problem solving. The content of this book unleashes a great opportunity for researchers, lecturers and practitioners interested in swarm intelligence, optimization problems and artificial intelligence.

Applied Optimization and Swarm Intelligence Elsevier

A guide to modern optimization applications and techniques in newly emerging areas spanning optimization, data science, machine intelligence, engineering, and computer sciences Optimization Techniques and Applications with Examples introduces the fundamentals of all the commonly used techniques in optimization that encompass the broadness and diversity of the methods (traditional and new) and algorithms. The author—a noted expert in the field—covers a wide range of topics including mathematical foundations, optimization formulation, optimality conditions, algorithmic complexity, linear programming, convex optimization, and integer programming. In addition, the book discusses artificial neural network, clustering and classifications, constraint-handling, queueing theory, support vector machine and multi-objective optimization, evolutionary computation, nature-inspired algorithms and many other topics. Designed as a practical resource, all topics are explained in detail with step-by-step examples to show how each method works. The book's exercises test the acquired knowledge that can be potentially

applied to real problem solving. By taking an informal approach to the subject, the author helps readers to rapidly acquire the basic knowledge in optimization, operational research, and applied data mining. This important resource: Offers an accessible and state-of-the-art introduction to the main optimization techniques Contains both traditional optimization techniques and the most current algorithms and swarm intelligence-based techniques Presents a balance of theory, algorithms, and implementation Includes more than 100 worked examples with step-by-step explanations Written for upper undergraduates and graduates in a standard course on optimization, operations research and data mining, Optimization Techniques and Applications with Examples is a highly accessible guide to understanding the fundamentals of all the commonly used techniques in optimization.

Advances in Nature-Inspired Computing and Applications Springer Nature

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

Advanced Computational Paradigms and Hybrid Intelligent Computing Springer This book discusses the current research and concepts in data science and how these can be addressed using different nature-inspired optimization techniques.

Focusing on various data science problems, including classification, clustering, forecasting, and deep learning, it explores how researchers are using nature-inspired optimization techniques to find solutions to these problems in domains such as disease analysis and health care, object recognition, vehicular ad-hoc networking, high-dimensional data analysis, gene expression analysis, microgrids, and deep learning. As such it provides insights and inspiration for researchers to wanting to employ nature-inspired optimization techniques in their own endeavors.
Nature Inspired Computing for Data Science Springer Nature
Computational intelligence (CI) lies at the interface between engineering and computer science; control engineering, where problems are solved using computer-assisted methods. Thus, it can be regarded as an indispensable basis for all artificial intelligence (AI) activities. This book collects surveys of most recent theoretical approaches focusing on fuzzy systems, neurocomputing, and nature inspired algorithms. It also presents surveys of up-to-date research and application with special focus on fuzzy systems as well as on applications in life sciences and neuronal computing.
Optimization Techniques and Applications with Examples CRC Press
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

Springer

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

Clever Algorithms Birkhäuser

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.
Computational Intelligence Springer Nature
The manufacturing system is going through substantial changes and developments in light of Industry 4.0. Newer manufacturing technologies are being developed and applied. There is a need to optimize these techniques when applied in different circumstances with respect to materials, tools, product configurations, and process parameters. This book covers computational intelligence applied to manufacturing. It discusses nature-inspired optimization of processes and their design and development in manufacturing systems. It explores all manufacturing processes, at both macro and micro levels, and offers manufacturing philosophies. Nonconventional manufacturing, real industry problems and case studies, research on generative processes, and relevance of all this to Industry 4.0 is also included. Researchers, students, academicians, and industry professionals will find this reference title very useful.
Proceedings of ICCSDF 2021 Springer Nature
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.

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