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Green Automation for Sustainable Environment - Sherin Zafar 2020-09-28

This book explores the concepts and role of green computing and its recent developments for making the environment sustainable. It focuses on green automation in disciplines such as computers, nanoscience, information technology, and biochemistry. This book is characterized through descriptions of sustainability, green computing, their relevance to the environment, society, and its applications. Presents how to make the environment sustainable through engineering aspects and green computing Explores concepts and the role of green computing with recent developments Processes green automation linked with various disciplines such as nanoscience, information technology, and biochemistry Explains the concepts of green computing linked with sustainable environment through information technology This book will be of interest to researchers, libraries, students, and academicians that are interested in the concepts of green computing linked with green automation through information technology and their impacts on the future.

Innovative Computing, Optimization and Its Applications - Ivan Zelinka 2017-11-20

This book presents the latest research of the field of optimization, modeling and algorithms, discussing the real-world application problems associated with new innovative methodologies. The requirements and demands of problem solving have been increasing exponentially and new computer science and engineering technologies have reduced the scope of data coverage worldwide. The recent advances in information communication technology (ICT) have contributed to reducing the gaps in the coverage of domains around the globe. The book is a valuable reference work for researchers in the fields of computer science and engineering with a particular focus on modeling, simulation and optimization as well as for postgraduates, managers, economists and decision makers

Deep Neural Evolution - Hitoshi Iba 2020-05-20

This book delivers the state of the art in deep learning (DL) methods hybridized with evolutionary computation (EC). Over the last decade, DL has dramatically reformed many domains: computer vision, speech recognition, healthcare, and automatic game playing, to mention only a few. All DL models, using different architectures and algorithms, utilize multiple processing layers for extracting a hierarchy of abstractions of data. Their remarkable successes notwithstanding, these powerful models are facing many challenges, and this book presents the collaborative efforts by researchers in EC to solve some of the problems in DL. EC comprises optimization techniques that are useful when problems are complex or poorly understood, or insufficient information about the problem domain is available. This family of algorithms has proven effective in solving problems with challenging characteristics such as non-convexity, non-linearity, noise, and irregularity, which dampen the performance of most classic optimization schemes. Furthermore, EC has been extensively and successfully applied in artificial neural network (ANN) research —from parameter estimation to structure optimization. Consequently, EC researchers are enthusiastic about applying their arsenal for the design and optimization of deep neural networks (DNN). This book brings together the recent progress in DL research where the focus is particularly on three sub-domains that integrate EC with DL: (1) EC for hyper-parameter optimization in DNN; (2) EC for DNN architecture design; and (3) Deep neuroevolution. The book also presents interesting applications of DL with EC in real-world problems, e.g., malware classification and object detection. Additionally, it covers recent applications of EC in DL, e.g. generative adversarial networks (GAN) training and adversarial attacks. The book aims to prompt and facilitate the research in DL with EC both in theory and in practice.

Quantum Annealing and Related Optimization Methods - Arnab Das 2005-11-10

physics

Metaheuristics - El-Ghazali Talbi 2009-05-27

A unified view of metaheuristics This book provides a complete background on metaheuristics and shows readers how to design and implement efficient algorithms to solve complex optimization problems across a diverse range of applications, from networking and bioinformatics to engineering design, routing, and scheduling. It presents the main design questions for all families of metaheuristics and clearly illustrates how to implement the algorithms under a software framework to reuse both the design and code. Throughout the book, the key search components of metaheuristics are considered as a toolbox for: Designing efficient metaheuristics (e.g. local search, tabu search, simulated annealing, evolutionary algorithms, particle swarm optimization, scatter search, ant colonies, bee colonies, artificial immune systems) for optimization problems Designing efficient metaheuristics for multi-objective optimization problems Designing hybrid, parallel, and distributed metaheuristics Implementing metaheuristics on sequential and parallel machines Using many case studies and treating design and implementation independently, this book gives readers the skills necessary to solve large-scale optimization problems quickly and efficiently. It is a valuable reference for practicing engineers and researchers from diverse areas dealing with optimization or machine learning; and graduate students in computer science, operations research, control, engineering, business and management, and applied mathematics.

Learning and Intelligent Optimization - Ilias S. Kotsireas 2020-07-17

This book constitutes the refereed post-conference proceedings on Learning and Intelligent Optimization, LION 14, held in Athens, Greece, in May 2020. The 37 full papers presented together with one invited paper have been carefully reviewed and selected from 75 submissions. LION deals with designing and engineering ways of "learning" about the performance of different techniques, and ways of using past experience about the algorithm behavior to improve performance in the future. Intelligent learning schemes for mining the knowledge obtained online or offline can improve the algorithm design process and simplify the applications of high-performance optimization methods. Combinations of different algorithms can further improve the robustness and performance of the individual components. Due to the COVID-19 pandemic, LION 14 was not held as a physical meeting.

Nature-inspired Metaheuristic Algorithms - Xin-She Yang 2010

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.

Artificial Intelligence and Games - Georgios N. Yannakakis 2018-02-17

This is the first textbook dedicated to explaining how artificial intelligence (AI) techniques can be used in and for games. After introductory chapters that explain the background and key techniques in AI and games, the authors explain how to use AI to play games, to generate content for games and to model players. The book will be suitable for undergraduate and graduate courses in games, artificial intelligence, design, human-computer interaction, and computational intelligence, and also for self-study by industrial game developers and practitioners. The authors have developed a website (http://www.gameaibook.org) that complements the material covered in the book with up-to-date exercises, lecture slides and reading.

Metaheuristics: Outlines, MATLAB Codes and Examples - Ali Kaveh 2019-03-29

The book presents eight well-known and often used algorithms besides nine newly developed algorithms by the first author and his students in a practical implementation framework. Matlab codes and some benchmark structural optimization problems are provided. The aim is to provide an efficient context for experienced researchers or readers not familiar with theory, applications and computational developments of the considered metaheuristics. The information will also be of interest to readers interested in application of metaheuristics for hard optimization, comparing conceptually different metaheuristics and designing new metaheuristics.

Universal Artificial Intelligence - Marcus Hutter 2006-01-17

Personal motivation. The dream of creating artificial devices that reach or outperform human intelligence is an old one. It is also one of the dreams of my youth, which have never left me. What makes this challenge so interesting? A solution would have enormous implications on our society, and there are reasons to believe that the AI problem can be solved in my expected lifetime. So, it's worth sticking to it for a lifetime, even if it takes 30 years or so to reap the benefits. The AI problem. The science of artificial intelligence (AI) may be defined as the construction of intelligent systems and their analysis. A natural definition of a system is anything that has an input and an output stream. Intelligence is more complicated. It can have many faces like creativity, solving prob lems, pattern recognition, classification, learning, induction, deduction, build ing analogies, optimization, surviving in an environment, language processing, and knowledge. A formal definition incorporating every aspect of intelligence, however, seems difficult. Most, if not all known facets of intelligence can be formulated as goal driven or, more precisely, as maximizing some utility func tion. It is, therefore, sufficient to study goal-driven AI; e. g. the (biological) goal of animals and humans is to survive and spread. The goal of AI systems should be to be useful to humans.

Metaheuristics for Structural Design and Analysis - Yusuf Cengiz Toklu 2021-07-21

Metaheuristics for Structural Design and Analysis discusses general properties and types of metaheuristic techniques, basic principles of topology, shape and size optimization of structures, and applications of metaheuristic algorithms in solving structural design problems. Analysis of structures using metaheuristic algorithms is also discussed. Comparisons are made with classical methods and modern computational methods through metaheuristic algorithms. The book is designed for senior structural engineering students, graduate students, academicians and practitioners.

Advances in Artificial Intelligence - Enrique Alba 2021-09-13

This book constitutes the refereed proceedings of the 19th Conference of the Spanish Association for Artificial Intelligence, CAEPIA 2020, which was cancelled due to the COVID-19 pandemic, amalgamated with CAEPIA 2021, and held in Malaga, Spain, during September 2021. The 25 full papers presented were carefully selected from 40 submissions. The Conference of the Spanish Association of Artificial Intelligence (CAEPIA) is a biennial forum open to researchers from all over the world to present and discuss their latest scientific and technological advances in Artificial Intelligence (AI). The book is subdivided into the following topical headings: machine learning, optimization and search, and real-world applications. It covers such themes as ambient intelligence and smart environments; computer vision and robotics; constraints, search and planning; creativity and A.I.; education and A.I.; explainable and responsible A.I.; foundation, models and applications of A.I, and others.

Encyclopedia of Optimization - Christodoulos A. Floudas 2008-09-04

The goal of the Encyclopedia of Optimization is to introduce the reader to a complete set of topics that show the spectrum of research, the richness of ideas, and the breadth of applications that has come from this field. The second edition builds on the success of the former edition with more than 150 completely new entries, designed to ensure that the reference addresses recent areas where optimization theories and techniques have advanced. Particularly heavy attention resulted in health science and transportation, with entries such as "Algorithms for Genomics", "Optimization and Radiotherapy Treatment Design", and "Crew Scheduling".

Women in Industrial and Systems Engineering - Alice E. Smith 2019-09-13

This book presents a diversity of innovative and impactful research in the field of industrial and systems engineering (ISE) led by women investigators. After a Foreword by Margaret L. Brandeau, an eminent woman scholar in the field, the book is divided into the following sections: Analytics, Education, Health, Logistics, and Production. Also included is a comprehensive biography on the historic luminary of industrial engineering, Lillian Moeller Gilbreth. Each chapter presents an opportunity to learn about the impact of the field of industrial and systems engineering and women's important contributions to it. Topics range from big data analysis, to improving cancer treatment, to sustainability in product design, to teamwork in engineering education. A total of 24 topics touch on many of the challenges facing the world today and these solutions by women researchers are valuable for their technical innovation and excellence and their non-traditional perspective. Found within each author's biography are their motivations for entering the field and how they view their contributions, providing inspiration and guidance to those entering industrial engineering.

Iterative Methods in Combinatorial Optimization - Lap Chi Lau 2011-04-18

With the advent of approximation algorithms for NP-hard combinatorial optimization problems, several techniques from exact optimization such as the primal-dual method have proven their staying power and versatility. This book describes a simple and powerful method that is iterative in essence and similarly useful in a variety of settings for exact and approximate optimization. The authors highlight the commonality and uses of this method to prove a variety of classical polyhedral results on matchings, trees, matroids and flows. The presentation style is elementary enough to be accessible to anyone with exposure to basic linear algebra and graph theory, making the book suitable for introductory courses in combinatorial optimization at the upper undergraduate and beginning graduate levels. Discussions of advanced applications illustrate their potential for future application in research in approximation algorithms.

Hybrid Quantum Metaheuristics - Siddhartha Bhattacharyya 2022-05-08

The reference text introduces the principles of quantum mechanics to evolve hybrid metaheuristics-based optimization techniques useful for real world engineering and scientific problems. The text covers advances and trends in methodological approaches, theoretical studies, mathematical and applied techniques related to hybrid quantum metaheuristics and their applications to engineering problems. The book will be accompanied by additional resources including video demonstration for each chapter. It will be a useful text for graduate students and professional in the field of electrical engineering, electronics and communications engineering, and computer science engineering, this text: Discusses quantum mechanical principles in detail. Emphasizes the recent and upcoming hybrid quantum metaheuristics in a comprehensive manner. Provides comparative statistical test analysis with conventional hybrid metaheuristics. Highlights real-life case studies, applications, and video demonstrations.

Recent Advances on Soft Computing and Data Mining - Rozaida Ghazali 2018-01-11

This book offers a systematic overview of the concepts and practical techniques that readers need to get the most out of their large-scale data mining projects and research studies. It guides them through the data-analytical thinking essential to extract useful information and obtain commercial value from the data. Presenting the outcomes of International Conference on Soft Computing and Data Mining (SCDM-2017), held in Johor, Malaysia on February 6–8, 2018, it provides a well-balanced integration of soft computing and data mining techniques. The two constituents are brought together in various combinations of applications and practices. To thrive in these data-driven ecosystems, researchers, engineers, data analysts, practitioners, and managers must understand the design choice and options of soft computing and data mining techniques, and as such this book is a valuable resource, helping readers solve complex benchmark problems and better appreciate the concepts, tools, and techniques employed.

Handbook of Heuristics - Rafael Martí 2017-01-16

Heuristics are strategies using readily accessible, loosely applicable information to control problem solving. Algorithms, for example, are a type of heuristic. By contrast, Metaheuristics are methods used to design Heuristics and may coordinate the usage of several Heuristics toward the formulation of a single method. GRASP (Greedy Randomized Adaptive Search Procedures) is an example of a Metaheuristic. To the layman, heuristics may be thought of as ‘rules of thumb’ but despite its imprecision, heuristics is a very rich field that refers to experience-based techniques for problem-solving, learning, and discovery. Any given solution/heuristic is not guaranteed to be optimal but heuristic methodologies are used to speed up the process of finding satisfactory solutions where optimal solutions are impractical. The introduction to this Handbook provides an overview of the history of Heuristics along with main issues regarding the methodologies covered. This is followed by Chapters containing various examples of local searches, search strategies and Metaheuristics, leading to an analyses of Heuristics and search algorithms. The reference concludes with numerous illustrations of the highly applicable nature and implementation of Heuristics in our daily life. Each chapter of this work includes an abstract/introduction with a short description of the methodology. Key words are also necessary as part of top-matter to each chapter to enable maximum search engine optimization. Next, chapters will include discussion of the adaptation of this methodology to solve a difficult optimization problem, and experiments on a set of representative problems.

A New Meta-heuristic Optimization Algorithm Based on the String Theory Paradigm from Physics - Oscar Castillo 2021-09-24

This book focuses on the fields of nature-inspired algorithms, optimization problems and fuzzy logic. In this book, a new metaheuristic based on String Theory from Physics is proposed. It is important to mention that we have proposed the new algorithm to generate new potential solutions in optimization problems in order to find new ways that could improve the results in solving these problems. We are presenting the results for the proposed method in different cases of study. The first case, is optimization of traditional benchmark mathematical functions. The second case, is the optimization of benchmark functions of the CEC 2015 Competition and we are also presenting results of the CEC 2017 Competition on Constrained Real-Parameter Optimization that are problems that contain the presence of constraints that alter the shape of the search space making them more difficult to solve. Finally, in the third case, we are presenting the optimization of a fuzzy inference system, specifically for finding the optimal design of a fuzzy controller for an autonomous mobile robot. It is important to mention that in all study cases we are presenting statistical tests in or-der to validate the performance of proposed method. In summary, we believe that this book will be of great interest to a wide audience, ranging from engineering and science graduate students, to researchers and professors in computational intelligence, metaheuristics, optimization, robotics and control.

Applied Optimization and Swarm Intelligence - Eneko Osaba 2021-05-17
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.

Applications of Artificial Intelligence in Engineering - Xiao-Zhi Gao 2021-05-10
This book presents best selected papers presented at the First Global Conference on Artificial Intelligence and Applications (GCAIA 2020), organized by the University of Engineering & Management, Jaipur, India, during 8–10 September 2020. The proceeding will be targeting the current research works in the domain of intelligent systems and artificial intelligence.

深層学習とメタヒューリスティクス - 伊庭斉志 2019-11-23
深層学習、進化計算、メタヒューリスティクス…人工知能キーワード!! 本書は、深層学習・ディープラーニング、進化計算、メタヒューリスティクスについて解説します。深層学習は画像処理や自然言語処理などさまざまに応用され、人工知能の重要手法です。またメタヒューリスティクスは生物や物理化学現象をもとにした最適化・AI手法です。本書ではDeep Neural Evolutionの基礎から応用までをわかりやすく説明します。また、メタヒューリスティクス、進化計算についてデモンストレーションとなるサンプルプログラム（C++ ,Java等）を提供します。このような方におすすめ・情報系の大学学部生，院生，研究者・最適化や機械学習に興味をもつエンジニア 主要目次 第1章 AIのための進化論 第2章 深層学習とディープラーニング 第3章 メタヒューリスティクス 第4章 生物らしい計算知能 第5章 ニューロ進化と遺伝子ネットワーク 第6章 ディープ・ニューラルエボリューション

Explainable and Transparent AI and Multi-Agent Systems - Davide Calvaresi 2021-07-16
This book constitutes the proceedings of the Third International Workshop on Explainable, Transparent AI and Multi-Agent Systems, EXTRAAMAS 2021, which was held virtually due to the COVID-19 pandemic. The 19 long revised papers and 1 short contribution were carefully selected from 32 submissions. The papers are organized in the following topical sections: XAI & machine learning; XAI vision, understanding, deployment and evaluation; XAI applications; XAI logic and argumentation; decentralized and heterogeneous XAI.

AI and SWARM - Hitoshi Iba 2019-09-17
This book provides theoretical and practical knowledge on AI and swarm intelligence. It provides a methodology for EA (evolutionary algorithm)-based approach for complex adaptive systems with the integration of several meta-heuristics, e.g., ACO (Ant Colony Optimization), ABC (Artificial Bee Colony), and PSO (Particle Swarm Optimization), etc. These developments contribute towards better problem-solving methodologies in AI. The book also covers emerging uses of swarm intelligence in applications such as complex adaptive systems, reaction-diffusion computing, and diffusion-limited aggregation, etc. Another emphasis is its real-world applications. We give empirical examples from real-world problems and show that the proposed approaches are successful when addressing tasks from such areas as swarm robotics, silicon traffics, image understanding, Vornoi diagrams, queuing theory, and slime intelligence, etc. Each chapter begins with the background of the problem followed by the current state-of-the-art techniques of the field, and ends with a detailed discussion. In addition, the simulators, based on optimizers such as PSO and ABC complex adaptive system simulation, are described in detail. These simulators, as well as some source codes, are available online on the author’s website for the benefit of readers interested in getting some hands-on experience of the subject. The concepts presented in this book aim to promote and facilitate the effective research in swarm intelligence approaches in both theory and practice. This book would also be of value to other readers because it covers interdisciplinary research topics that encompass problem-solving tasks in AI, complex adaptive systems, and meta-heuristics.

Algorithms for Optimization - Mykel J. Kochenderfer 2019-03-12
A comprehensive introduction to optimization with a focus on practical algorithms for the design of engineering systems. This book offers a comprehensive introduction to optimization with a focus on practical algorithms. The book

approaches optimization from an engineering perspective, where the objective is to design a system that optimizes a set of metrics subject to constraints. Readers will learn about computational approaches for a range of challenges, including searching high-dimensional spaces, handling problems where there are multiple competing objectives, and accommodating uncertainty in the metrics. Figures, examples, and exercises convey the intuition behind the mathematical approaches. The text provides concrete implementations in the Julia programming language. Topics covered include derivatives and their generalization to multiple dimensions; local descent and first- and second-order methods that inform local descent; stochastic methods, which introduce randomness into the optimization process; linear constrained optimization, when both the objective function and the constraints are linear; surrogate models, probabilistic surrogate models, and using probabilistic surrogate models to guide optimization; optimization under uncertainty; uncertainty propagation; expression optimization; and multidisciplinary design optimization. Appendixes offer an introduction to the Julia language, test functions for evaluating algorithm performance, and mathematical concepts used in the derivation and analysis of the optimization methods discussed in the text. The book can be used by advanced undergraduates and graduate students in mathematics, statistics, computer science, any engineering field, (including electrical engineering and aerospace engineering), and operations research, and as a reference for professionals.

Machine Learning for Cyber Security - Xiaofeng Chen 2020-11-10

This three volume book set constitutes the proceedings of the Third International Conference on Machine Learning for Cyber Security, ML4CS 2020, held in Xi’an, China in October 2020. The 118 full papers and 40 short papers presented were carefully reviewed and selected from 360 submissions. The papers offer a wide range of the following subjects: Machine learning, security, privacy-preserving, cyber security, Adversarial machine Learning, Malware detection and analysis, Data mining, and Artificial Intelligence.

Theory of Evolutionary Computation - Benjamin Doerr 2020-12-03

This edited book reports on recent developments in the theory of evolutionary computation, or more generally the domain of randomized search heuristics. It starts with two chapters on mathematical methods that are often used in the analysis of randomized search heuristics, followed by three chapters on how to measure the complexity of a search heuristic: black-box complexity, a counterpart of classical complexity theory in black-box optimization; parameterized complexity, aimed at a more fine-grained view of the difficulty of problems; and the fixed-budget perspective, which answers the question of how good a solution will be after investing a certain computational budget. The book then describes theoretical results on three important questions in evolutionary computation: how to profit from changing the parameters during the run of an algorithm; how evolutionary algorithms cope with dynamically changing or stochastic environments; and how population diversity influences performance. Finally, the book looks at three algorithm classes that have only recently become the focus of theoretical work: estimation-of-distribution algorithms; artificial immune systems; and genetic programming. Throughout the book the contributing authors try to develop an understanding for how these methods work, and why they are so successful in many applications. The book will be useful for students and researchers in theoretical computer science and evolutionary computing.

Advances in Swarm Intelligence for Optimizing Problems in Computer Science - Anand Nayyar 2018-10-03

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.

Proximal Algorithms - Neal Parikh 2013-11

Proximal Algorithms discusses proximal operators and proximal algorithms, and illustrates their applicability to standard and distributed convex optimization in general and many applications of recent interest in particular. Much like Newton's method is a standard tool for solving unconstrained smooth optimization problems of modest size, proximal algorithms can be viewed as an analogous tool for nonsmooth, constrained, large-scale, or distributed versions of these problems. They are very generally applicable, but are especially well-suited to problems of substantial recent interest involving large or high-dimensional datasets. Proximal methods sit at a higher level of abstraction than classical algorithms like Newton's method: the base operation is evaluating the proximal operator of a function, which itself involves solving a small convex optimization problem. These subproblems, which generalize the problem of projecting a point onto a convex set, often admit closed-form solutions or can be solved very quickly with standard or simple specialized methods. Proximal Algorithms discusses different interpretations of proximal operators and algorithms, looks at their connections to many other topics in optimization and applied mathematics, surveys some popular algorithms, and provides a large number of examples of proximal operators that commonly arise in practice.

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 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

Black Holes in Higher Dimensions - Gary T. Horowitz 2012-04-19

"Black holes are one of the most remarkable predictions of Einstein's general relativity. Now widely accepted by the scientific community, most work has focussed on black holes in our familiar four spacetime dimensions. But in recent years, ideas in brane-world cosmology, string theory, and gauge/gravity duality have all motivated a study of black holes in more than four dimensions, with surprising results. In higher dimensions, black holes exist with exotic shapes and unusual dynamics. Edited by leadingexpert Gary Horowitz, this exciting book is the first devoted to this new field. The major discoveries are explained by the people who made them: RobMyers describes theMyers-Perry solutions that represent rotating black holes in higher dimensions; Ruth Gregory describes the Gregory-Laflamme instability of black strings; and Juan Maldacena introduces gauge/gravity duality, the remarkable correspondence that relates a gravitational theory to nongravitational physics. There are two additional chapters on this duality describing how black holes can be used to describe relativistic fluids and aspects of condensed matter physics"--

Metaheuristics and Optimization in Computer and Electrical Engineering - Navid Razmjooy 2020-11-16

The use of artificial intelligence, especially in the field of optimization is increasing day by day. The purpose of this book is to explore the possibility of using different kinds of optimization algorithms to advance and enhance the tools used for computer and electrical engineering purposes.

Metaheuristics in Machine Learning: Theory and Applications - Diego Oliva

This book is a collection of the most recent approaches that combine metaheuristics and machine learning. Some of the methods considered in this book are evolutionary, swarm, machine learning, and deep learning. The chapters were classified based on the content; then, the sections are thematic. Different applications and implementations are included; in this sense, the book provides theory and practical content with novel machine learning and metaheuristic algorithms. The chapters were compiled using a scientific perspective. Accordingly, the book is primarily intended for undergraduate and postgraduate students of Science, Engineering, and Computational Mathematics and is useful in courses on Artificial Intelligence, Advanced Machine Learning, among others. Likewise, the book is useful for research from the evolutionary computation, artificial intelligence, and image processing communities.

Stochastic Local Search - Holger H. Hoos 2005

Stochastic local search (SLS) algorithms are among the most prominent and successful techniques for solving computationally difficult problems. Offering a systematic treatment of SLS algorithms, this book examines the general concepts and specific instances of SLS algorithms and considers their development, analysis and application.

Quantum Quenching, Annealing and Computation - Anjan Kumar Chandra 2010-07-23

The process of realizing the ground state of some typical (frustrated) quantum many-body systems, starting from the 'disordered' or excited states, can be formally mapped to the search of solutions for computationally hard problems. The dynamics through the critical point, in between, are therefore extremely crucial. In the context of such computational optimization problems, the dynamics (of rapid quenching or slow annealing), while tuning the appropriate fields or fluctuations, in particular while crossing the quantum critical point, are extremely intriguing and are being investigated these days intensively. Several successful methods and tricks are now well established. This volume gives a collection of introductory reviews on such developments written by well-known experts. It concentrates on quantum phase transitions and their dynamics as the transition or critical points are crossed. Both the quenching and annealing dynamics are extensively covered. We hope these timely reviews will inspire the young researchers to join and c- tribute to this fast-growing, intellectually challenging, as well as technologically demanding field. We are extremely thankful to the contributors for their intensive work and pleasant cooperations. We are also very much indebted to Kausik Das for his help in compiling this book. Finally, we express our gratitude to Johannes Zittartz, Series Editor, LNP, and Christian Caron of physics editorial department of Springer for their encouragement and support.

Machine Learning and Metaheuristics Algorithms, and Applications - Sabu M. Thampi 2020-04-04

This book constitutes the refereed proceedings of the First Symposium on Machine Learning and Metaheuristics Algorithms, and Applications, held in Trivandrum, India, in December 2019. The 17 full papers and 6 short papers presented in this volume were thoroughly reviewed and selected from 53 qualified submissions. The papers cover such topics as machine learning, artificial intelligence, Internet of Things, modeling and simulation, disctibuted computing methodologies, computer graphics, etc.

Advances in Soft Computing - Ildar Batyrshin 2019-01-02

The two-volume set LNAI 11288 and 11289 constitutes the proceedings of the 17th Mexican International Conference on Artificial Intelligence, MICAI 2018, held in Guadalajara, Mexico, in October 2018. The total of 62 papers presented in these two volumes was carefully reviewed and selected from 149 submissions. The contributions are organized in topical as follows: Part I: evolutionary and nature-inspired intelligence; machine learning; fuzzy logic and uncertainty management. Part II: knowledge representation, reasoning, and optimization; natural language processing; and robotics and computer vision.

Handbook of AI-based Metaheuristics - Anand J. Kulkarni 2021-09-02

At the heart of the optimization domain are mathematical modeling of the problem and the solution methodologies. The problems are becoming larger and with growing complexity. Such problems are becoming cumbersome when handled by traditional optimization methods. This has motivated researchers to resort to artificial intelligence (AI)-based, nature-inspired solution methodologies or algorithms. The Handbook of AI-based Metaheuristics provides a wide-ranging reference to the theoretical and mathematical formulations of metaheuristics, including bio-inspired, swarm-based, socio-cultural, and physics-based methods or algorithms; their testing and validation, along with detailed illustrative solutions and applications; and newly devised metaheuristic algorithms. This will be a valuable reference for researchers in industry and academia, as well as for all Master's and PhD students working in the metaheuristics and applications domains.

Robust Discrete Optimization and Its Applications - Panos Kouvelis 2013-03-09

This book deals with decision making in environments of significant data un certainty, with particular emphasis on operations and production management applications. For such environments, we suggest the use of the robustness ap proach to decision making, which assumes inadequate knowledge of the decision maker about the random state of nature and develops a decision that hedges against the worst contingency that may arise. The main motivating factors for a decision maker to use the robustness approach are: • It does not ignore uncertainty and takes a proactive step in response to the fact that forecasted values of uncertain parameters will not occur in most environments; • It applies to decisions of unique, non-repetitive nature, which are common in many fast and dynamically changing environments; • It accounts for the risk averse nature of decision makers; and • It recognizes that even though decision environments are fraught with data uncertainties, decisions are evaluated ex post with the realized data. For all of the above reasons, robust decisions are dear to the heart of opera tional decision makers. This book takes a giant first step in presenting decision support tools and solution methods for generating robust decisions in a variety of interesting application environments. Robust Discrete Optimization is a comprehensive mathematical programming framework for robust decision making.

Theory of Randomized Search Heuristics -