

Implementation Of Ant Colony Algorithms In Matlab

Ant Colony Optimization Helio Barbosa.2013-02-20 Ant Colony Optimization (ACO) is the best example of how studies aimed at understanding and modeling the behavior of ants and other social insects can provide inspiration for the development of computational algorithms for the solution of difficult mathematical problems. Introduced by Marco Dorigo in his PhD thesis (1992) and initially applied to the travelling salesman problem, the ACO field has experienced a tremendous growth, standing today as an important nature-inspired stochastic metaheuristic for hard optimization problems. This book presents state-of-the-art ACO methods and is divided into two parts: (I) Techniques, which includes parallel implementations, and (II) Applications, where recent contributions of ACO to diverse fields, such as traffic congestion and control, structural optimization, manufacturing, and genomics are presented.

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

understanding of robot analysis from an optimization standpoint. *Swarm Intelligent Systems* Nadia Nedjah, Luiza Macedo Mourelle. 2006-06-27 Systems designers have learned that many agents co-operating within the system can solve very complex problems with a minimal design effort. In general, multi-agent systems that use swarm intelligence are said to be swarm intelligent systems. Today, these are mostly used as search engines and optimization tools. This volume reviews innovative methodologies of swarm intelligence, outlines the foundations of engineering swarm intelligent systems and applications, and relates experiences using the particle swarm optimisation.

Swarm Intelligence Algorithms (Two Volume Set) Adam Slowik. 2020-08-19 Swarm intelligence algorithms are a form of nature-based optimization algorithms. Their main inspiration is the cooperative behavior of animals within specific communities. This can be described as simple behaviors of individuals along with the mechanisms for sharing knowledge between them, resulting in the complex behavior of the entire community. Examples of such behavior can be found in ant colonies, bee swarms, schools of fish or bird flocks. Swarm intelligence algorithms are used to solve difficult optimization problems for which there are no exact solving methods or the use of such methods is impossible, e.g. due to unacceptable computational time. This set comprises two volumes: *Swarm Intelligence Algorithms: A Tutorial* and *Swarm Intelligence Algorithms: Modifications and Applications*. The first volume thoroughly presents the basics of 24 algorithms selected from the entire family of swarm intelligence algorithms. It contains a detailed explanation of how each algorithm works, along with relevant program codes in Matlab and the C++ programming language, as well as numerical examples illustrating step-by-step how individual algorithms work. The second volume describes selected modifications of these algorithms and presents their practical applications. This book presents 24 swarm algorithms together

with their modifications and practical applications. Each chapter is devoted to one algorithm. It contains a short description along with a pseudo-code showing the various stages of its operation. In addition, each chapter contains a description of selected modifications of the algorithm and shows how it can be used to solve a selected practical problem.

On Multi-objective Optimization Based on Ant Colony Optimization Rizk Masoud Rizk Allah, Abd Allah A.

Mousa.2014-06-13 Ant Colony Optimization (ACO) is a meta-heuristic algorithm which has been successfully applied to tackle various combinatorial optimization problems, but its ability to cope with multi-objective optimization problems is yet to be explored widely. Since most real-world search and optimization problems are naturally posed as non-linear programming problems having multi-objective problems. Therefore, the principal goal of this work aims to implement a specialized version of the ant colony optimization algorithm capable of finding a set of solutions for multi-objective optimization problems. Features relevant to ant colony optimization include a highly efficient form of best-path exploitation (pheromone detection), and a sensible mechanism for exploration (probabilistic path selection). The results demonstrate superiority of the proposed algorithm and confirm its potential to solve the multi-objective problems and engineering applications.

The Social Sciences Empowered Ford Lumban Gaol, Fonny Hutagalung, Chew Fong Peng.2020-04-14 The Social Sciences Empowered contains papers presented at the 7th International Congress on Interdisciplinary Behavior and Social Science 2018 (ICIBSoS 2018), held 21-22 July 2018, Bangkok, Thailand, 22-23 September 2018, Bali, Indonesia, 6-7 October 2018, Kuta, Bali, Indonesia, and 24-25 November 2018, Yogyakarta, Indonesia. ICIBSoS 2018 provided the economic and social analysis necessary for addressing issues in Humanities disciplines such as Education, Sociology, Anthropology, Politics, History, Philosophy,

Psychology as well as food security. Contributions to these proceedings give necessary insight into the cultural and human dimension of such diverse research areas as transport, climate change, energy and agriculture. ICIBSoS 2018 also analyses the cultural, behavioural, psychological, social and institutional drivers that transform people's behaviour and the global environment. ICIBSoS 2018 proposes new ideas, strategies and governance structures for overcoming the crisis from a global perspective, innovating the public sector and business models, promoting social innovation and fostering creativity in the development of services and product design.

Optimization Rajesh Kumar Arora.2015-05-06 Choose the Correct Solution Method for Your Optimization Problem Optimization: Algorithms and Applications presents a variety of solution techniques for optimization problems, emphasizing concepts rather than rigorous mathematical details and proofs. The book covers both gradient and stochastic methods as solution techniques for unconstrained and co

Communications, Signal Processing, and Systems Qilian Liang,Xin Liu,Zhenyu Na,Wei Wang,Jiasong Mu,Baoju Zhang.2019-05-04 This book brings together papers from the 2018 International Conference on Communications, Signal Processing, and Systems, which was held in Dalian, China on July 14–16, 2018. Presenting the latest developments and discussing the interactions and links between these multidisciplinary fields, the book spans topics ranging from communications, signal processing and systems. It is aimed at undergraduate and graduate electrical engineering, computer science and mathematics students, researchers and engineers from academia and industry as well as government employees.

Intelligent Systems and Applications Kohei Arai,Supriya Kapoor,Rahul Bhatia.2018-11-08 Gathering the Proceedings of the 2018 Intelligent Systems Conference (IntelliSys 2018), this book offers a remarkable collection of chapters covering a wide

range of topics in intelligent systems and computing, and their real-world applications. The Conference attracted a total of 568 submissions from pioneering researchers, scientists, industrial engineers, and students from all around the world. These submissions underwent a double-blind peer review process, after which 194 (including 13 poster papers) were selected to be included in these proceedings. As intelligent systems continue to replace and sometimes outperform human intelligence in decision-making processes, they have made it possible to tackle many problems more effectively. This branching out of computational intelligence in several directions, and the use of intelligent systems in everyday applications, have created the need for such an international conference, which serves as a venue for reporting on cutting-edge innovations and developments. This book collects both theory and application-based chapters on all aspects of artificial intelligence, from classical to intelligent scope. Readers are sure to find the book both interesting and valuable, as it presents state-of-the-art intelligent methods and techniques for solving real-world problems, along with a vision of future research directions.

Bio-Inspired Computing and Applications De-Shuang Huang, Yong Gan, Prashan Premaratne, Kyungsook Han. 2012-01-05 The three-volume set LNCS 6838, LNAI 6839, and LNBI 6840 constitutes the thoroughly refereed post-conference proceedings of the 7th International Conference on Intelligent Computing, ICIC 2011, held in Zhengzhou, China, in August 2011. This volume contains 93 revised full papers, from a total of 281 presentations at the conference - carefully reviewed and selected from 832 initial submissions. The papers address all issues in Advanced Intelligent Computing, especially Methodologies and Applications, including theories, methodologies, and applications in science and technology. They include a range of techniques such as artificial intelligence, pattern recognition, evolutionary computing, informatics theories and applications, computational

neuroscience and bioscience, soft computing, human computer interface issues, etc.

Ant Colony Optimization and Swarm Intelligence Marco

Dorigo, Mauro Birattari, Christian Blum, Luca M.

Gambardella, Francesco Mondada, Thomas Stützle. 2004-11-24 1

With its fourth edition, the ANTS series of workshops has changed its name. The original ANTS-From Ant Colonies to Artificial Ants: International Workshop on Ant Algorithms has become ANTS - International Workshop on Ant Colony Optimization and Swarm Intelligence. This change is mainly due to the following reasons. First, the term ant algorithms was slower in spreading in the research community than the term swarm intelligence, while at the same time research in so-called swarm robotics was the subject of increasing activity: it was therefore an obvious choice to substitute the term ant algorithms with the more accepted and used term swarm intelligence. Second, although swarm intelligence research has undoubtedly produced a number of interesting and promising research directions, we think it is fair to say that its most successful strand is the one known as ant colony optimization. Ant colony optimization, first introduced in the early 1990s as a novel tool for the approximate solution of discrete optimization problems, has recently seen an explosion in the number of its applications, both to academic and real-world problems, and is currently being extended to the realm of continuous optimization (a few papers on this subject being published in these proceedings). It is therefore a reasonable choice to have the term ant colony optimization as part of the workshop name

Ant Colony Optimization and Applications Stefka

Fidanova. 2021-02-27 This book is interesting and full of new

ideas. It provokes the curiosity of the readers. The book targets both researchers and practitioners. The students and the researchers will acquire knowledge about ant colony optimization and its possible applications as well as practitioners will find new

ideas and solutions of their combinatorial optimization and decision-making problems. Ant colony optimization is between the best method for solving difficult optimization problems arising in real life and industry. It has obtained distinguished results on some applications with very restrictive constraints. The reader will find theoretical aspects of ant method as well as applications on a variety of problems. The following applications could be mentioned: multiple knapsack problem, which is an important economical problem; grid scheduling problem; GPS surveying problem; E. coli cultivation modeling; wireless sensor network positioning; image edges detection; workforce planning.

Intelligent Computing Theories and Application De-Shuang Huang, Kang-Hyun Jo, Juan Carlos Figueroa-García. 2017-07-18
This three-volume set LNCS 10361, LNCS 10362, and LNAI 10363 constitutes the refereed proceedings of the 13th International Conference on Intelligent Computing, ICIC 2017, held in Liverpool, UK, in August 2017. The 221 full papers and 15 short papers of the three proceedings volumes were carefully reviewed and selected from 639 submissions. This second volume of the set comprises 74 papers. The papers are organized in topical sections such as Pattern Recognition; Image Processing; Virtual Reality and Human-Computer Interaction; Healthcare Informatics Theory and Methods; Genetic Algorithms; Blind Source Separation; Intelligent Fault Diagnosis; Machine Learning; Knowledge Discovery and Data Mining; Gene Expression Array Analysis; Systems Biology; Modeling, Simulation, and Optimization of Biological Systems; Intelligent Computing in Computational Biology; Computational Genomics; Computational Proteomics; Gene Regulation Modeling and Analysis; SNPs and Haplotype Analysis; Protein-Protein Interaction Prediction; Protein Structure and Function Prediction; Next-Gen Sequencing and Metagenomics; Structure Prediction and Folding; Biomarker Discovery; Applications of Machine Learning Techniques to Computational Proteomics, Genomics,

and Biological Sequence Analysis; Biomedical Image Analysis; Human-Machine Interaction: Shaping Tools Which Will Shape Us; Protein and Gene Bioinformatics: Analysis, Algorithms and Applications; Special Session on Computer Vision based Navigation; Neural Networks: Theory and Application.

Ant Colony Optimization and Constraint Programming

Christine Solnon.2013-03-04 Ant colony optimization is a metaheuristic which has been successfully applied to a wide range of combinatorial optimization problems. The author describes this metaheuristic and studies its efficiency for solving some hard combinatorial problems, with a specific focus on constraint programming. The text is organized into three parts. The first part introduces constraint programming, which provides high level features to declaratively model problems by means of constraints. It describes the main existing approaches for solving constraint satisfaction problems, including complete tree search approaches and metaheuristics, and shows how they can be integrated within constraint programming languages. The second part describes the ant colony optimization metaheuristic and illustrates its capabilities on different constraint satisfaction problems. The third part shows how the ant colony may be integrated within a constraint programming language, thus combining the expressive power of constraint programming languages, to describe problems in a declarative way, and the solving power of ant colony optimization to efficiently solve these problems.

The Application of Ant Colony Optimization Ali

Soofastaei.2022-05-11 The application of advanced analytics in science and technology is rapidly expanding, and developing optimization techniques is critical to this expansion. Instead of relying on dated procedures, researchers can reap greater rewards by utilizing cutting-edge optimization techniques like population-based metaheuristic models, which can quickly generate a solution with acceptable quality. Ant Colony Optimization (ACO) is one the most critical and widely used

models among heuristics and meta-heuristics. This book discusses ACO applications in Hybrid Electric Vehicles (HEVs), multi-robot systems, wireless multi-hop networks, and preventive, predictive maintenance.

Ant Colony Optimization Avi Ostfeld.2011-02-04 Ants

communicate information by leaving pheromone tracks. A moving ant leaves, in varying quantities, some pheromone on the ground to mark its way. While an isolated ant moves essentially at random, an ant encountering a previously laid trail is able to detect it and decide with high probability to follow it, thus reinforcing the track with its own pheromone. The collective behavior that emerges is thus a positive feedback: where the more the ants following a track, the more attractive that track becomes for being followed; thus the probability with which an ant chooses a path increases with the number of ants that previously chose the same path. This elementary ant's behavior inspired the development of ant colony optimization by Marco Dorigo in 1992, constructing a meta-heuristic stochastic combinatorial computational methodology belonging to a family of related meta-heuristic methods such as simulated annealing, Tabu search and genetic algorithms. This book covers in twenty chapters state of the art methods and applications of utilizing ant colony optimization algorithms. New methods and theory such as multi colony ant algorithm based upon a new pheromone arithmetic crossover and a repulsive operator, new findings on ant colony convergence, and a diversity of engineering and science applications from transportation, water resources, electrical and computer science disciplines are presented.

Ant Algorithms Marco Dorigo, Gianni Di Caro, Michael Sampels.2003-08-02 This book constitutes the refereed proceedings of the Third International Workshop on Ant Algorithms, ANTS 2002, held in Brussels, Belgium in September 2002. The 17 revised full papers, 11 short papers, and extended poster abstracts presented were carefully reviewed and selected

from 52 submissions. The papers deal with theoretical and foundational aspects and a variety of new variants of ant algorithms as well as with a broad variety of optimization applications in networking and operations research. All in all, this book presents the state of the art in research and development in the emerging field of ant algorithms

Sine Cosine Algorithm for Optimization Jagdish Chand

Bansal, Prathu Bajpai, Anjali Rawat, Atulya K. Nagar. 2023-01-30

This open access book serves as a compact source of information on sine cosine algorithm (SCA) and a foundation for developing and advancing SCA and its applications. SCA is an easy, user-friendly, and strong candidate in the field of metaheuristics algorithms. Despite being a relatively new metaheuristic algorithm, it has achieved widespread acceptance among researchers due to its easy implementation and robust optimization capabilities. Its effectiveness and advantages have been demonstrated in various applications ranging from machine learning, engineering design, and wireless sensor network to environmental modeling. The book provides a comprehensive account of the SCA, including details of the underlying ideas, the modified versions, various applications, and a working MATLAB code for the basic SCA.

Lecture Notes in Real-Time Intelligent Systems Jolanta

Mizera-Pietraszko, Pit Pichappan. 2017-08-07

Intelligent computing refers greatly to artificial intelligence with the aim at making computer to act as a human. This newly developed area of real-time intelligent computing integrates the aspect of dynamic environments with the human intelligence. This book presents a comprehensive practical and easy to read account which describes current state-of-the art in designing and implementing real-time intelligent computing to robotics, alert systems, IoT, remote access control, multi-agent systems, networking, mobile smart systems, crowd sourcing, broadband systems, cloud computing, streaming data and many other applications areas.

The solutions discussed in this book will encourage the researchers and IT professional to put the methods into their practice.

Handbook of Wireless Sensor Networks: Issues and Challenges in Current Scenario's Pradeep Kumar Singh, Bharat K.

Bhargava, Marcin Paprzycki, Narottam Chand Kaushal, Wei-Chiang Hong. 2020-02-08 This book explores various challenging problems and applications areas of wireless sensor networks (WSNs), and identifies the current issues and future research challenges. Discussing the latest developments and advances, it covers all aspects of in WSNs, from architecture to protocols design, and from algorithm development to synchronization issues. As such the book is an essential reference resource for undergraduate and postgraduate students as well as scholars and academics working in the field.

Practical Genetic Algorithms Randy L. Haupt, Sue Ellen Haupt. 2004-07-30 * This book deals with the fundamentals of genetic algorithms and their applications in a variety of different areas of engineering and science * Most significant update to the second edition is the MATLAB codes that accompany the text * Provides a thorough discussion of hybrid genetic algorithms * Features more examples than first edition

Metaheuristics: Outlines, MATLAB Codes and Examples Ali Kaveh, Taha Bakhshpoori. 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.

Ant Colony Optimization and Swarm Intelligence Marco Dorigo, Luca Maria Gambardella, Mauro Birattari, Alcherio Martinoli, Riccardo Poli, Thomas Stützle. 2006-08-29 This book constitutes the refereed proceedings of the 5th International Workshop on Ant Colony Optimization and Swarm Intelligence, ANTS 2006, held in Brussels, Belgium, in September 2006. The 27 revised full papers, 23 revised short papers, and 12 extended abstracts presented were carefully reviewed and selected from 115 submissions.

Recent Advances on Hybrid Intelligent Systems Oscar Castillo, Patricia Melin, Janusz Kacprzyk. 2012-09-14 This book presents recent advances on hybrid intelligent systems using soft computing techniques for intelligent control and robotics, pattern recognition, time series prediction and optimization of complex problems. Soft Computing (SC) consists of several intelligent computing paradigms, including fuzzy logic, neural networks, and bio-inspired optimization algorithms, which can be used to produce powerful hybrid intelligent systems. The book is organized in five main parts, which contain groups of papers around a similar subject. The first part consists of papers with the main theme of hybrid intelligent systems for control and robotics, which are basically state of the art papers that propose new models and concepts, which can be the basis for achieving intelligent control and mobile robotics. The second part contains papers with the main theme of hybrid intelligent systems for pattern recognition and time series prediction, which are basically papers using nature-inspired techniques, like evolutionary algorithms, fuzzy logic and neural networks, for achieving efficient pattern recognition or time series prediction. The third part contains papers with the theme of bio-inspired and genetic optimization methods, which basically consider the proposal of new methods and applications of bio-inspired optimization to solve complex optimization of real problems. The

fourth part contains papers that deal with the application of intelligent optimization techniques in real world problems in scheduling, planning and manufacturing. The fifth part contains papers with the theme of evolutionary methods and intelligent computing, which are papers considering soft computing methods for applications related to diverse areas, such as natural language processing, recommending systems and optimization.

Ant Colony Optimization and Swarm Intelligence Marco

Dorigo.2006-08-30 This book constitutes the refereed proceedings of the 5th International Workshop on Ant Colony Optimization and Swarm Intelligence, ANTS 2006, held in Brussels, Belgium, in September 2006. The 27 revised full papers, 23 revised short papers, and 12 extended abstracts presented were carefully reviewed and selected from 115 submissions.

New Advances at the Intersection of Brain-Inspired Learning and Deep Learning in Autonomous Vehicles and Robotics Guang

Chen,Pascual Campoy,Changhong Fu,Caixia Cai.2020-09-02 This eBook is a collection of articles from a Frontiers Research Topic. Frontiers Research Topics are very popular trademarks of the Frontiers Journals Series: they are collections of at least ten articles, all centered on a particular subject. With their unique mix of varied contributions from Original Research to Review Articles, Frontiers Research Topics unify the most influential researchers, the latest key findings and historical advances in a hot research area! Find out more on how to host your own Frontiers Research Topic or contribute to one as an author by contacting the Frontiers Editorial Office:

frontiersin.org/about/contact.

Decision Tree and Ensemble Learning Based on Ant Colony Optimization Jan Kozak.2018-06-20 This book not only discusses

the important topics in the area of machine learning and combinatorial optimization, it also combines them into one. This was decisive for choosing the material to be included in the book and determining its order of presentation. Decision trees are a

popular method of classification as well as of knowledge representation. At the same time, they are easy to implement as the building blocks of an ensemble of classifiers. Admittedly, however, the task of constructing a near-optimal decision tree is a very complex process. The good results typically achieved by the ant colony optimization algorithms when dealing with combinatorial optimization problems suggest the possibility of also using that approach for effectively constructing decision trees. The underlying rationale is that both problem classes can be presented as graphs. This fact leads to option of considering a larger spectrum of solutions than those based on the heuristic. Moreover, ant colony optimization algorithms can be used to advantage when building ensembles of classifiers. This book is a combination of a research monograph and a textbook. It can be used in graduate courses, but is also of interest to researchers, both specialists in machine learning and those applying machine learning methods to cope with problems from any field of R&D.

Innovative Data Communication Technologies and Application

Jennifer S. Raj, Abul Bashar, S. R. Jino

Ramson. 2020-01-30 This book presents emerging concepts in

data mining, big data analysis, communication, and networking technologies, and discusses the state-of-the-art in data

engineering practices to tackle massive data distributions in

smart networked environments. It also provides insights into

potential data distribution challenges in ubiquitous data-driven

networks, highlighting research on the theoretical and systematic

framework for analyzing, testing and designing intelligent data

analysis models for evolving communication frameworks. Further,

the book showcases the latest developments in wireless sensor

networks, cloud computing, mobile network, autonomous

systems, cryptography, automation, and other communication and

networking technologies. In addition, it addresses data security,

privacy and trust, wireless networks, data classification, data

prediction, performance analysis, data validation and verification

models, machine learning, sentiment analysis, and various data analysis techniques.

EMIS 2023 Luning Liu,Chen Chen,Sabrina Ahmad.2023-06-15

This volume contains the papers presented at the 2nd International Conference on Engineering Management and Information Science (EMIS 2023), held during December 24th-26th, 2023 (virtual event). With the theme of “bringing together global wisdom in scientific innovation to promote high-quality development”, the immediate purpose of this Conference was to gather experienced as well as young scientists who are interested in working actively on various aspects of engineering management and information science to drive development. The major topics covered in the Conference are: Project Management Information System, Logistics Information System, Intelligent Transportation Engineering, Passwords and Security Systems, Numerical Algorithms for Computers, Innovative Network Systems and Applications, Knowledge Acquisition and Management, etc... Here, scholars, experts, and researchers are welcomed to share their research progress and inspirations. It is a great opportunity to promote academic communication and collaboration worldwide.

Introduction to Genetic Algorithms S.N. Sivanandam,S. N.

Deepa.2007-10-24 This book offers a basic introduction to genetic algorithms. It provides a detailed explanation of genetic algorithm concepts and examines numerous genetic algorithm optimization problems. In addition, the book presents implementation of optimization problems using C and C++ as well as simulated solutions for genetic algorithm problems using MATLAB 7.0. It also includes application case studies on genetic algorithms in emerging fields.

Advances in Guidance, Navigation and Control Liang

Yan,Haibin Duan,Yimin Deng.2023-02-10 This book features the latest theoretical results and techniques in the field of guidance, navigation, and control (GNC) of vehicles and aircrafts. It covers

a wide range of topics, including but not limited to, intelligent computing communication and control; new methods of navigation, estimation and tracking; control of multiple moving objects; manned and autonomous unmanned systems; guidance, navigation and control of miniature aircraft; and sensor systems for guidance, navigation and control etc. Presenting recent advances in the form of illustrations, tables, and text, it also provides detailed information of a number of the studies, to offer readers insights for their own research. In addition, the book addresses fundamental concepts and studies in the development of GNC, making it a valuable resource for both beginners and researchers wanting to further their understanding of guidance, navigation, and control.

Computational Intelligence Paradigms for Optimization

Problems Using MATLAB®/SIMULINK® S. Sumathi, L. Ashok Kumar, Surekha. P. 2018-09-03

Considered one of the most innovative research directions, computational intelligence (CI) embraces techniques that use global search optimization, machine learning, approximate reasoning, and connectionist systems to develop efficient, robust, and easy-to-use solutions amidst multiple decision variables, complex constraints, and tumultuous environments. CI techniques involve a combination of learning, adaptation, and evolution used for intelligent applications. Computational Intelligence Paradigms for Optimization Problems Using MATLAB®/ Simulink® explores the performance of CI in terms of knowledge representation, adaptability, optimality, and processing speed for different real-world optimization problems. Focusing on the practical implementation of CI techniques, this book: Discusses the role of CI paradigms in engineering applications such as unit commitment and economic load dispatch, harmonic reduction, load frequency control and automatic voltage regulation, job shop scheduling, multidepot vehicle routing, and digital image watermarking Explains the impact of CI on power systems,

control systems, industrial automation, and image processing through the above-mentioned applications Shows how to apply CI algorithms to constraint-based optimization problems using MATLAB® m-files and Simulink® models Includes experimental analyses and results of test systems Computational Intelligence Paradigms for Optimization Problems Using MATLAB®/ Simulink® provides a valuable reference for industry professionals and advanced undergraduate, postgraduate, and research students.

Introduction to Nature-Inspired Optimization George Lindfield, John Penny. 2017-08-10 Introduction to Nature-Inspired Optimization brings together many of the innovative mathematical methods for non-linear optimization that have their origins in the way various species behave in order to optimize their chances of survival. The book describes each method, examines their strengths and weaknesses, and where appropriate, provides the MATLAB code to give practical insight into the detailed structure of these methods and how they work. Nature-inspired algorithms emulate processes that are found in the natural world, spurring interest for optimization. Lindfield/Penny provide concise coverage to all the major algorithms, including genetic algorithms, artificial bee colony algorithms, ant colony optimization and the cuckoo search algorithm, among others. This book provides a quick reference to practicing engineers, researchers and graduate students who work in the field of optimization. Applies concepts in nature and biology to develop new algorithms for nonlinear optimization Offers working MATLAB® programs for the major algorithms described, applying them to a range of problems Provides useful comparative studies of the algorithms, highlighting their strengths and weaknesses Discusses the current state-of-the-field and indicates possible areas of future development
Theoretical and Practical Aspects of Ant Colony Optimization Christian Blum. 2004 Combinatorial optimization problems are of

high academical and practical importance. Unfortunately, many of them belong to the class of NP-hard problems and are therefore intractable. In other words, as their dimension increases, the time needed by exact methods to find an optimal solution grows exponentially. Metaheuristics are approximate methods for attacking these problems. An approximate method is a technique that is applied in order to find a good enough solution in a reasonable amount of time. Examples of metaheuristics are simulated annealing, tabu search, evolutionary computation, and ant colony optimization (ACO), the subject of this book. The contributions of this book to ACO research are twofold. First, some new theoretical results are proven that improve our understanding of how ACO works. Second, a new framework for ACO algorithms is proposed that is shown to perform at the state-of-the-art level on some important combinatorial optimization problems such as the k-cardinality tree problem and the group shop scheduling problem, which is a general shop scheduling problem that includes among others the well-known job shop scheduling and the open shop scheduling problems.

Ant Colony Optimization Avi Ostfeld.2011-02-04 Ants

communicate information by leaving pheromone tracks. A moving ant leaves, in varying quantities, some pheromone on the ground to mark its way. While an isolated ant moves essentially at random, an ant encountering a previously laid trail is able to detect it and decide with high probability to follow it, thus reinforcing the track with its own pheromone. The collective behavior that emerges is thus a positive feedback: where the more the ants following a track, the more attractive that track becomes for being followed; thus the probability with which an ant chooses a path increases with the number of ants that previously chose the same path. This elementary ant's behavior inspired the development of ant colony optimization by Marco Dorigo in 1992, constructing a meta-heuristic stochastic combinatorial computational methodology belonging to a family

of related meta-heuristic methods such as simulated annealing, Tabu search and genetic algorithms. This book covers in twenty chapters state of the art methods and applications of utilizing ant colony optimization algorithms. New methods and theory such as multi colony ant algorithm based upon a new pheromone arithmetic crossover and a repulsive operator, new findings on ant colony convergence, and a diversity of engineering and science applications from transportation, water resources, electrical and computer science disciplines are presented.

Grokking Artificial Intelligence Algorithms Rishal

Hurbans.2020-07-20 From start to finish, the best book to help you learn AI algorithms and recall why and how you use them. -

Linda Ristevski, York Region District School Board "This book takes an impossibly broad area of computer science and

communicates what working developers need to understand in a clear and thorough way." - David Jacobs, Product Advance Local

Key Features Master the core algorithms of deep learning and AI Build an intuitive understanding of AI problems and solutions

Written in simple language, with lots of illustrations and hands-on examples Creative coding exercises, including building a maze

puzzle game and exploring drone optimization About The Book "Artificial intelligence" requires teaching a computer how to

approach different types of problems in a systematic way. The core of AI is the algorithms that the system uses to do things like

identifying objects in an image, interpreting the meaning of text, or looking for patterns in data to spot fraud and other anomalies.

Mastering the core algorithms for search, image recognition, and other common tasks is essential to building good AI applications

Grokking Artificial Intelligence Algorithms uses illustrations, exercises, and jargon-free explanations to teach fundamental AI

concepts.You'll explore coding challenges like detecting bank fraud, creating artistic masterpieces, and setting a self-driving

car in motion. All you need is the algebra you remember from high school math class and beginning programming skills. What

You Will Learn Use cases for different AI algorithms Intelligent search for decision making Biologically inspired algorithms Machine learning and neural networks Reinforcement learning to build a better robot This Book Is Written For For software developers with high school-level math skills. About the Author Rishal Hurbans is a technologist, startup and AI group founder, and international speaker. Table of Contents 1 Intuition of artificial intelligence 2 Search fundamentals 3 Intelligent search 4 Evolutionary algorithms 5 Advanced evolutionary approaches 6 Swarm intelligence: Ants 7 Swarm intelligence: Particles 8 Machine learning 9 Artificial neural networks 10 Reinforcement learning with Q-learning

Handbook of Swarm Intelligence Bijaya Ketan Panigrahi, Yuhui Shi, Meng-Hiot Lim. 2011-02-04 From nature, we observe swarming behavior in the form of ant colonies, bird flocking, animal herding, honey bees, swarming of bacteria, and many more. It is only in recent years that researchers have taken notice of such natural swarming systems as culmination of some form of innate collective intelligence, albeit swarm intelligence (SI) - a metaphor that inspires a myriad of computational problem-solving techniques. In computational intelligence, swarm-like algorithms have been successfully applied to solve many real-world problems in engineering and sciences. This handbook volume serves as a useful foundational as well as consolidatory state-of-art collection of articles in the field from various researchers around the globe. It has a rich collection of contributions pertaining to the theoretical and empirical study of single and multi-objective variants of swarm intelligence based algorithms like particle swarm optimization (PSO), ant colony optimization (ACO), bacterial foraging optimization algorithm (BFOA), honey bee social foraging algorithms, and harmony search (HS). With chapters describing various applications of SI techniques in real-world engineering problems, this handbook can be a valuable resource for researchers and practitioners, giving an in-depth

flavor of what SI is capable of achieving.

Optimization of PID Controllers Using Ant Colony and Genetic Algorithms Muhammet Ünal, Ayça Ak, Vedat Topuz, Hasan

Erdal. 2012-09-13 Artificial neural networks, genetic algorithms and the ant colony optimization algorithm have become a highly effective tool for solving hard optimization problems. As their popularity has increased, applications of these algorithms have grown in more than equal measure. While many of the books available on these subjects only provide a cursory discussion of theory, the present book gives special emphasis to the theoretical background that is behind these algorithms and their applications. Moreover, this book introduces a novel real time control algorithm, that uses genetic algorithm and ant colony optimization algorithms for optimizing PID controller parameters. In general, the present book represents a solid survey on artificial neural networks, genetic algorithms and the ant colony optimization algorithm and introduces novel practical elements related to the application of these methods to process system control.

Computational Intelligence Paradigms S. Sumathi, Surekha

Paneerselvam. 2010-01-05 Offering a wide range of programming examples implemented in MATLAB®, Computational Intelligence Paradigms: Theory and Applications Using MATLAB® presents theoretical concepts and a general framework for computational intelligence (CI) approaches, including artificial neural networks, fuzzy systems, evolutionary computation, genetic algorithms and programming, and swarm intelligence. It covers numerous intelligent computing methodologies and algorithms used in CI research. The book first focuses on neural networks, including common artificial neural networks; neural networks based on data classification, data association, and data conceptualization; and real-world applications of neural networks. It then discusses fuzzy sets, fuzzy rules, applications of fuzzy systems, and different types of fused neuro-fuzzy systems, before providing MATLAB

illustrations of ANFIS, classification and regression trees, fuzzy c-means clustering algorithms, fuzzy ART map, and Takagi-Sugeno inference systems. The authors also describe the history, advantages, and disadvantages of evolutionary computation and include solved MATLAB programs to illustrate the implementation of evolutionary computation in various problems. After exploring the operators and parameters of genetic algorithms, they cover the steps and MATLAB routines of genetic programming. The final chapter introduces swarm intelligence and its applications, particle swarm optimization, and ant colony optimization. Full of worked examples and end-of-chapter questions, this comprehensive book explains how to use MATLAB to implement CI techniques for the solution of biological problems. It will help readers with their work on evolution dynamics, self-organization, natural and artificial morphogenesis, emergent collective behaviors, swarm intelligence, evolutionary strategies, genetic programming, and the evolution of social behaviors.

Ant Colony Optimization Marco Dorigo, Thomas

Stutzle.2004-06-04 An overview of the rapidly growing field of ant colony optimization that describes theoretical findings, the major algorithms, and current applications. The complex social behaviors of ants have been much studied by science, and computer scientists are now finding that these behavior patterns can provide models for solving difficult combinatorial optimization problems. The attempt to develop algorithms inspired by one aspect of ant behavior, the ability to find what computer scientists would call shortest paths, has become the field of ant colony optimization (ACO), the most successful and widely recognized algorithmic technique based on ant behavior. This book presents an overview of this rapidly growing field, from its theoretical inception to practical applications, including descriptions of many available ACO algorithms and their uses. The book first describes the translation of observed ant behavior

into working optimization algorithms. The ant colony metaheuristic is then introduced and viewed in the general context of combinatorial optimization. This is followed by a detailed description and guide to all major ACO algorithms and a report on current theoretical findings. The book surveys ACO applications now in use, including routing, assignment, scheduling, subset, machine learning, and bioinformatics problems. AntNet, an ACO algorithm designed for the network routing problem, is described in detail. The authors conclude by summarizing the progress in the field and outlining future research directions. Each chapter ends with bibliographic material, bullet points setting out important ideas covered in the chapter, and exercises. Ant Colony Optimization will be of interest to academic and industry researchers, graduate students, and practitioners who wish to learn how to implement ACO algorithms.

Implementation Of Ant Colony Algorithms In Matlab Book Review: Unveiling the Power of Words

In a world driven by information and connectivity, the energy of words has been evident than ever. They have the capability to inspire, provoke, and ignite change. Such could be the essence of the book **Implementation Of Ant Colony Algorithms In Matlab**, a literary masterpiece that delves deep into the significance of words and their impact on our lives. Compiled by a renowned author, this captivating work takes readers on a transformative journey, unraveling the secrets and potential behind every word. In this review, we shall explore the book's key themes, examine its writing style, and analyze its overall impact on readers.

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