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SWARM INTELLIGENCE AND BIO-INSPIRED COMPUTATION

THEORY AND APPLICATIONS

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Swarm Intelligence And Bio Inspired Computation Theory And Applications Elsevier Insights

**Xin-She Yang, Zhihua Cui, Renbin
Xiao, Amir Hossein Gandomi, Mehmet
Karamanoglu**

Swarm Intelligence And Bio Inspired Computation Theory And Applications Elsevier Insights:

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

Swarm Intelligence and Bio-Inspired Computation Tamás Varga,András Király,János Abonyi,2013-05-16 Advanced inventory management in complex supply chains requires effective and robust nonlinear optimization due to the stochastic nature of supply and demand variations Application of estimated gradients can boost up the convergence of Particle Swarm Optimization PSO algorithm but classical gradient calculation cannot be applied to stochastic and uncertain systems In these situations Monte Carlo MC simulation can be applied to determine the gradient We developed a memory based algorithm where instead of generating and evaluating new simulated samples the stored and shared former function evaluations of the particles are sampled to estimate the gradients by local weighted least squares regression The performance of the resulted regional gradient based PSO is verified by several benchmark problems and in a complex application example where optimal reorder points of a supply chain are determined

Nature-Inspired Computation and Swarm Intelligence Xin-She Yang,2020-04-10 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 Optimization Techniques and Applications with Examples Xin-She Yang,2018-09-19 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 **Nature-Inspired Optimization Algorithms** Xin-She Yang,2020-09-09 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 **Swarm Intelligence and Bio-Inspired Computation** Xin-She Yang,Mehmet Karamanoglu,2013-05-16 Swarm intelligence SI and bio inspired computing in general have attracted great interest in almost every area of science engineering and industry over the last two decades In this chapter we provide an overview of some of the most widely used bio inspired algorithms especially those based on SI such as cuckoo search firefly algorithm and particle swarm optimization We also analyze the essence of algorithms and their connections to self organization Furthermore we highlight the main challenging issues associated with these metaheuristic algorithms with in depth discussions Finally we provide some key open problems that need to be addressed in the next decade **Bio-Inspired Computation in Telecommunications** Xin-She Yang,Su Fong Chien,T.O. Ting,2015-02-11 Bio inspired computation especially those based on swarm intelligence has become increasingly popular in the last decade Bio Inspired Computation in Telecommunications reviews the latest developments in bio inspired computation from both theory and application as they relate to telecommunications and image processing providing a complete resource that analyzes and discusses the latest and future trends in research directions Written by recognized experts this is a must have guide for researchers telecommunication engineers computer scientists and PhD students **Swarm Intelligence and Bio-Inspired Computation** Raha Imanirad,Julian Scott Yeomans,2013-05-16 In solving many practical mathematical programming applications it is generally preferable to formulate several quantifiably good alternatives that provide very different approaches to the particular problem This is because decision making typically involves complex problems that are riddled with incompatible performance objectives and possess competing design requirements which are very difficult if not impossible to quantify and capture at the time that the supporting decision models are constructed There are invariably unmodeled design issues not apparent at the time of model construction which can greatly impact the acceptability of the model s solutions Consequently it is preferable to generate several alternatives that provide multiple disparate perspectives to the problem These alternatives should possess near optimal objective measures with respect to all known modeled objective s but be fundamentally different from each other in terms of the system structures characterized by their decision variables This solution approach is referred to as modeling to generate alternatives MGA This chapter provides a synopsis of various MGA techniques and demonstrates how biologically inspired MGA algorithms are particularly efficient at creating multiple solution alternatives that both satisfy required system performance criteria and yet are maximally different in their decision spaces The efficacy and efficiency of these MGA methods are demonstrated using a number of case studies

Machine Intelligence and Bio-inspired Computation Misty Blowers,Jonathan Williams,Russell D. Hall,2016
 Bio-Inspired Computational Algorithms and Their Applications Shangce Gao,2012-03-07 Bio inspired computational algorithms are always hot research topics in artificial intelligence communities Biology is a bewildering source of inspiration for the design of intelligent artifacts that are capable of efficient and autonomous operation in unknown and changing

environments It is difficult to resist the fascination of creating artifacts that display elements of lifelike intelligence thus needing techniques for control optimization prediction security design and so on Bio Inspired Computational Algorithms and Their Applications is a compendium that addresses this need It integrates contrasting techniques of genetic algorithms artificial immune systems particle swarm optimization and hybrid models to solve many real world problems The works presented in this book give insights into the creation of innovative improvements over algorithm performance potential applications on various practical tasks and combination of different techniques The book provides a reference to researchers practitioners and students in both artificial intelligence and engineering communities forming a foundation for the development of the field

Bio-Inspired Computing: Theories and Applications Linqiang Pan,Tingfang Wu,Jianqing Lin,2025-08-23

The two volume set CCIS 2530 and 2531 constitutes the refereed post conference proceedings of the 19th International Conference on Bio Inspired Computing Theories and Applications BIC TA 2024 held in Suzhou China during December 20 22 2024 The 41 full papers presented in these proceedings were carefully reviewed and selected from 139 submissions The papers are organized in the following topical sections Neural Computing Evolutionary Computation Bio inspired Computing and Applications

Bio-Inspired Computational Algorithms and Their Applications Shangce Gao,2012-03-07 Bio inspired computational algorithms are always hot research topics in artificial intelligence communities Biology is a bewildering source of inspiration for the design of intelligent artifacts that are capable of efficient and autonomous operation in unknown and changing environments It is difficult to resist the fascination of creating artifacts that display elements of lifelike intelligence thus needing techniques for control optimization prediction security design and so on Bio Inspired Computational Algorithms and Their Applications is a compendium that addresses this need It integrates contrasting techniques of genetic algorithms artificial immune systems particle swarm optimization and hybrid models to solve many real world problems The works presented in this book give insights into the creation of innovative improvements over algorithm performance potential applications on various practical tasks and combination of different techniques The book provides a reference to researchers practitioners and students in both artificial intelligence and engineering

communities forming a foundation for the development of the field

Bio-Inspired Computing for Information Retrieval Applications Acharjya, D.P.,Mitra, Anirban,2017-02-14 The growing presence of biologically inspired processing has caused significant changes in data retrieval With the ubiquity of these technologies more effective and streamlined data processing techniques are available Bio Inspired Computing for Information Retrieval Applications is a key resource on the latest advances and research regarding current techniques that have evolved from biologically inspired processes and its application to a variety of problems Highlighting multidisciplinary studies on data processing swarm based clustering and evolutionary computation this publication is an ideal reference source for researchers academics professionals students and practitioners

Handbook of Bioinspired Algorithms and Applications Stephan Olariu,Albert Y. Zomaya,2005-09-29

The mystique of biologically inspired or bioinspired paradigms is their ability to describe and solve complex relationships from intrinsically very simple initial conditions and with little or no knowledge of the search space Edited by two prominent well respected researchers the Handbook of Bioinspired Algorithms and Applications reveals the [Bio-inspired Algorithms in Machine Learning and Deep Learning for Disease Detection](#) Balasubramaniam S,Seifedine Kadry,Manoj Kumar TK,K. Satheesh Kumar,2025-03-13

Currently computational intelligence approaches are utilised in various science and engineering applications to analyse information make decisions and achieve optimisation goals Over the past few decades various techniques and algorithms have been created in disciplines such as genetic algorithms artificial neural networks evolutionary algorithms and fuzzy algorithms In the coming years intelligent optimisation algorithms are anticipated to become more efficient in addressing various issues in engineering scientific medical space and artificial satellite fields particularly in early disease diagnosis A metaheuristic in computer science is designed to discover optimisation algorithms capable of solving intricate issues Metaheuristics are optimisation algorithms that mimic biological behaviours of animals or birds and are utilised to discover the best solution for a certain problem A meta heuristic is an advanced approach used by heuristics to tackle intricate optimisation problems A metaheuristic in mathematical programming is a method that seeks a solution to an optimisation problem Metaheuristics utilise a heuristic function to assist in the search process Heuristic search can be categorised as blind search or informed search Meta heuristic optimisation algorithms are gaining popularity in various applications due to their simplicity independence from data trends ability to find optimal solutions and versatility across different fields Recently many nature inspired computation algorithms have been utilised to diagnose people with different diseases Nature inspired methodologies are now widely utilised across several fields for tasks such as data analysis decision making and optimisation Techniques inspired by nature are categorised as either biology based or natural phenomena based Bioinspired computing encompasses various topics in computer science mathematics and biology in recent years Bio inspired computer optimisation algorithms are a developing method that utilises concepts and inspiration from biological development to create new and resilient competitive strategies Bio inspired optimisation algorithms have gained recognition in machine learning and deep learning for solving complicated issues in science and engineering Utilising BIAs learning methods with machine learning and deep learning shows great promise for accurately classifying medical conditions This book explores the historical development of bio inspired algorithms and their application in machine learning and deep learning models for disease diagnosis including COVID 19 heart diseases cancer diabetes and some other diseases It discusses the advantages of using bio inspired algorithms in disease diagnosis and concludes with research directions and future prospects in this field

[Bio-inspired Algorithms for Data Streaming and Visualization, Big Data Management, and Fog Computing](#)

Simon James Fong,Richard C. Millham,2020-08-25 This book aims to provide some insights into recently developed bio inspired algorithms within recent emerging trends of fog computing sentiment analysis and data streaming as well as to

provide a more comprehensive approach to the big data management from pre processing to analytics to visualization phases The subject area of this book is within the realm of computer science notably algorithms meta heuristic and more particularly bio inspired algorithms Although application domains of these new algorithms may be mentioned the scope of this book is not on the application of algorithms to specific or general domains but to provide an update on recent research trends for bio inspired algorithms within a specific application domain or emerging area These areas include data streaming fog computing and phases of big data management One of the reasons for writing this book is that the bio inspired approach does not receive much attention but shows considerable promise and diversity in terms of approach of many issues in big data and streaming Some novel approaches of this book are the use of these algorithms to all phases of data management not just a particular phase such as data mining or business intelligence as many books focus on effective demonstration of the effectiveness of a selected algorithm within a chapter against comparative algorithms using the experimental method Another novel approach is a brief overview and evaluation of traditional algorithms both sequential and parallel for use in data mining in order to provide an overview of existing algorithms in use This overview complements a further chapter on bio inspired algorithms for data mining to enable readers to make a more suitable choice of algorithm for data mining within a particular context In all chapters references for further reading are provided and in selected chapters the author also include ideas for future research *Bio-Inspired Computing and Networking* Yang Xiao, 2011-03-17 Seeking new methods to satisfy increasing communication demands researchers continue to find inspiration from the complex systems found in nature From ant inspired allocation to a swarm algorithm derived from honeybees Bio Inspired Computing and Networking explains how the study of biological systems can significantly improve computing networking and robotics Containing contributions from leading researchers from around the world the book investigates the fundamental aspects and applications of bio inspired computing and networking Presenting the latest advances in bio inspired communication computing networking clustering optimization and robotics the book considers state of the art approaches novel technologies and experimental studies including bio inspired Optimization of dynamic NP hard problems Top down controller design for distributing a robot swarm among multiple tasks Self organizing data and signals cellular systems Dynamic spectrum access in cognitive radio networks QoS aware architecture for scalable adaptive and survivable network systems Locomotion control of the Hexapod Robot Gregor III The book explores bio inspired topology control and reconfiguration methods as well as bio inspired localization synchronization and mobility approaches Providing wide ranging coverage that includes past approaches current challenges and emerging concepts such as the evolution and self healing of network architectures and protocols this comprehensive reference provides you with the well rounded understanding you need to continue the advancement of the development design and implementation of bio inspired computing and networking *Handbook of Research on Computational Intelligence Applications in Bioinformatics* Dash, Sujata, Subudhi, Bidyadhar, 2016-06-20 Developments in the areas of biology

and bioinformatics are continuously evolving and creating a plethora of data that needs to be analyzed and decrypted Since it can be difficult to decipher the multitudes of data within these areas new computational techniques and tools are being employed to assist researchers in their findings The Handbook of Research on Computational Intelligence Applications in Bioinformatics examines emergent research in handling real world problems through the application of various computation technologies and techniques Featuring theoretical concepts and best practices in the areas of computational intelligence artificial intelligence big data and bio inspired computing this publication is a critical reference source for graduate students professionals academics and researchers

Recent Developments in Biologically Inspired Computing Leandro N. De Castro,Fernando J. Von Zuben,2005-01-01 Recent Developments in Biologically Inspired Computing is necessary reading for undergraduate and graduate students and researchers interested in knowing the most recent advances in problem solving techniques inspired by nature This book covers the most relevant areas in computational intelligence including evolutionary algorithms artificial neural networks artificial immune systems and swarm systems It also brings together novel and philosophical trends in the exciting fields of artificial life and robotics This book has the advantage of covering a large number of computational approaches presenting the state of the art before entering into the details of specific extensions and new developments Pseudocodes flow charts and examples of applications are provided so as to help newcomers and mature researchers to get the point of the new approaches presented

Bio-Inspired Computational Intelligence and Applications Minrui Fei,George W. Irwin,Shiwei Ma,2007-08-26 This book is part of a two volume work that constitutes the refereed proceedings of the International Conference on Life System Modeling and Simulation LSMS 2007 held in Shanghai China September 2007 Coverage includes advanced neural network theory advanced evolutionary computing theory ant colonies and particle swarm optimization intelligent modeling monitoring and control of complex nonlinear systems as well as biomedical signal processing imaging and visualization

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