

# [PDF] Swarm Intelligence And Bio Inspired Computation 10 Intelligent Music Composition

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**Swarm Intelligence and Bio-Inspired Computation**-Xin-She Yang  
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.

**Bio-Inspired Artificial Intelligence**-Dario Floreano 2008-08-22 A comprehensive introduction to new approaches in artificial intelligence and robotics that are inspired by self-organizing biological processes and structures. New approaches to artificial intelligence spring from the idea that intelligence emerges as much from cells, bodies, and societies as it does from evolution, development, and learning. Traditionally, artificial intelligence has been concerned with reproducing the abilities of human brains; newer approaches take inspiration from a wider range of biological structures that that are capable of autonomous self-organization. Examples of these new approaches include evolutionary computation and evolutionary electronics, artificial neural networks, immune systems, biorobotics, and swarm intelligence—to mention only a few. This book offers a comprehensive introduction to the emerging field of biologically inspired artificial intelligence that can be used as an upper-level text or as a reference for researchers. Each chapter presents computational approaches inspired by a different biological system; each begins with background information about the biological system and then proceeds to develop computational models that make use of biological concepts. The chapters cover evolutionary computation and electronics; cellular systems; neural systems, including neuromorphic engineering; developmental systems; immune systems; behavioral systems—including several approaches to robotics, including behavior-based, bio-mimetic, epigenetic, and

evolutionary robots; and collective systems, including swarm robotics as well as cooperative and competitive co-evolving systems. Chapters end with a concluding overview and suggested reading.

**Swarm Intelligence and Bio-Inspired Computation**-Xin-She Yang

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 Networking**-Daniel Câmara 2015-08-19 Bio-inspired

techniques are based on principles, or models, of biological systems. In general, natural systems present remarkable capabilities of resilience and adaptability. In this book, we explore how bio-inspired methods can solve different problems linked to computer networks. Future networks are expected to be autonomous, scalable and adaptive. During millions of years of evolution, nature has developed a number of different systems that present these and other characteristics required for the next generation networks. Indeed, a series of bio-inspired methods have been successfully used to solve the most diverse problems linked to computer networks. This book presents some of these techniques from a theoretical and practical point of view. Discusses the key concepts of bio-inspired networking to aid you in finding efficient networking solutions Delivers examples of techniques both in theoretical concepts and practical applications Helps you apply nature's dynamic resource and task management to your computer networks

**Swarm Intelligence and Bio-Inspired Computation**-Tamás Varga

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.

**Bio-inspired Algorithms for Engineering**-Nancy Arana-Daniel

2018-02-03 Bio-inspired Algorithms for Engineering builds a bridge between the proposed bio-inspired algorithms developed in the past few decades and their applications in real-life problems, not only in an academic context, but also in the real world. The book proposes novel algorithms to solve real-life, complex problems, combining well-known bio-inspired algorithms with new concepts, including both rigorous analyses and unique applications. It covers both theoretical and practical methodologies, allowing readers to learn more about the implementation of bio-inspired algorithms. This book is a useful resource for both academic and industrial engineers working on artificial intelligence, robotics, machine learning, vision, classification, pattern recognition, identification and control. Presents real-time implementation and simulation results for all the proposed schemes Offers a comparative analysis and rigorous analysis of the convergence of proposed algorithms Provides a guide for implementing each application at the end of each chapter Includes illustrations, tables and figures that facilitate the reader's comprehension of the proposed schemes and applications

**Swarm Intelligence and Bio-Inspired Computation**-Maximos A.

Kaliakatsos-Papakostas 2013-05-16 Automatic music composition has blossomed with the introduction of intelligent methodologies in computer science. Thereby, many methodologies for automatic music composition

have been or could be described as “intelligent,” but what exactly is it that makes them intelligent? Furthermore, is there any categorization of intelligent music composition (IMC) methodologies that is both consistent and descriptive? This chapter aims to provide some insights on what IMC methodologies are, through proposing and analyzing a detailed categorization of them. Toward this perspective, methodologies that incorporate bioinspired intelligent algorithms (such as cellular automata, L-systems, genetic algorithms, swarm intelligence, among others) as well as their combinations are considered and briefly reviewed. At the same time, a consistent categorization of these methodologies is proposed, taking into account the utilization of their intelligent algorithm in accordance to their overall compositional aims. To this end, three main categories can be defined: the “unsupervised,” the “supervised,” and the “interactive” IMC methodologies.

**Handbook of Bioinspired Algorithms and Applications**-Stephan Olariu  
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

**Swarm Intelligence and Bio-Inspired Computation**-Raha Imanirad  
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.

**Swarm Intelligence and Bio-Inspired Computation**-Momin Jamil  
2013-05-16 Test functions are important to validate and compare the performance of various optimization algorithms. In previous years, there have been many test or benchmark functions reported in the literature. However, there is no standard list or set of benchmark functions with diverse properties that algorithms may be tested upon. On the other hand, any new optimization algorithm should be tested by a diverse range of test or benchmark functions so as to see if it can solve certain types of problems or not. For this purpose, we compile here 140 benchmark functions for unconstrained optimization problems.

**Nature-Inspired Computation and Swarm Intelligence**-Xin-She Yang  
2020-04-24 Nature-inspired computation and swarm intelligence have become popular and effective tools for solving problems in optimization, computational intelligence, soft computing and data science. Recently, the literature in the field has expanded rapidly, with new algorithms and applications emerging. Nature-Inspired Computation and Swarm Intelligence: Algorithms, Theory and Applications is a timely reference giving a comprehensive review of relevant state-of-the-art developments in algorithms, theory and applications of nature-inspired algorithms and swarm intelligence. It reviews and documents the new developments, focusing on nature-inspired algorithms and their theoretical analysis, as well as providing a guide to their implementation. The book includes case studies of diverse real-world applications, balancing explanation of the theory with practical implementation. Nature-Inspired Computation and Swarm Intelligence: Algorithms, Theory and Applications is suitable for

researchers and graduate students in computer science, engineering, data science, and management science, who want a comprehensive review of algorithms, theory and implementation within the fields of nature inspired computation and swarm intelligence. Introduces nature-inspired algorithms and their fundamentals, including: particle swarm optimization, bat algorithm, cuckoo search, firefly algorithm, flower pollination algorithm, differential evolution and genetic algorithms as well as multi-objective optimization algorithms and others Provides a theoretical foundation and analyses of algorithms, including: statistical theory and Markov chain theory on the convergence and stability of algorithms, dynamical system theory, benchmarking of optimization, no-free-lunch theorems, and a generalized mathematical framework Includes a diversity of case studies of real-world applications: feature selection, clustering and classification, tuning of restricted Boltzmann machines, travelling salesman problem, classification of white blood cells, music generation by artificial intelligence, swarm robots, neural networks, engineering designs and others

**Swarm Intelligence and Bio-Inspired Computation**-Iztok Fister 2013-05-16 The “firefly algorithm” (FFA) is a modern metaheuristic algorithm, inspired by the behavior of fireflies. This algorithm and its variants have been successfully applied to many continuous optimization problems. This work analyzes the performance of the FFA when solving combinatorial optimization problems. In order to improve the results, the original FFA is extended and improved for self-adaptation of control parameters, and thus more directly balancing between exploration and exploitation in the search process of fireflies. We use a new population model to increase the selection pressure, and the next generation selects only the fittest between a parent and an offspring population. As a result, the proposed memetic self-adaptive FFA (MSA-FFA) is compared with other well-known graph coloring algorithms such as Tabucol, the hybrid evolutionary algorithm, and an evolutionary algorithm with stepwise adaptation of weights. Various experiments have been conducted on a huge set of randomly generated graphs. The results of these experiments show that the results of the MSA-FFA are comparable with other tested algorithms.

**Swarm Intelligence and Bio-Inspired Computation**-Gilang Kusuma Jati 2013-05-16 The “firefly algorithm” (FA) is a nature-inspired technique originally designed for solving continuous optimization problems. There are several existing approaches that apply FA also as a basis for solving discrete optimization problems, in particular the “traveling salesman problem” (TSP). In this chapter, we present a new movement scheme called edge-based movement, an operation which guarantees that a candidate solution more closely resembles another one. This leads to a more FA-like behavior of the algorithm. We investigate the performance of the ‘evolutionary discrete firefly algorithm’ when using this new edge-based movement and compare it against previous methods. Computer simulations show that the new movement scheme produces slightly better accuracy with much faster average time. The average speedup factor is 14.06 times.

**Bio-Inspired Computation and Applications in Image Processing**-Xin-She Yang 2016-08-09 Bio-Inspired Computation and Applications in Image Processing summarizes the latest developments in bio-inspired computation in image processing, focusing on nature-inspired algorithms that are linked with deep learning, such as ant colony optimization, particle swarm optimization, and bat and firefly algorithms that have recently emerged in the field. In addition to documenting state-of-the-art developments, this book also discusses future research trends in bio-inspired computation, helping researchers establish new research avenues to pursue. Reviews the latest developments in bio-inspired computation in image processing Focuses on the introduction and analysis of the key bio-inspired methods and techniques Combines theory with real-world applications in image processing Helps solve complex problems in image and signal processing Contains a diverse range of self-contained case studies in real-world applications

**Bio-Inspired Computation in Telecommunications**-Xin-She Yang 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 Algorithms (Two Volume Set)**-Adam Slowik

2021-01-26 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.

**Advances in Swarm Intelligence**-Ying Tan 2014-09-23 This book and its companion volume, LNCS vol. 8794 and 8795 constitute the proceedings of the 5th International Conference on Swarm Intelligence, ICSI 2014, held in Hefei, China in October 2014. The 107 revised full papers presented were

carefully reviewed and selected from 198 submissions. The papers are organized in 18 cohesive sections, 3 special sessions and one competitive session covering all major topics of swarm intelligence research and development such as novel swarm-based search methods; novel optimization algorithm; particle swarm optimization; ant colony optimization for travelling salesman problem; artificial bee colony algorithms; artificial immune system; evolutionary algorithms; neural networks and fuzzy methods; hybrid methods; multi-objective optimization; multi-agent systems; evolutionary clustering algorithms; classification methods; GPU-based methods; scheduling and path planning; wireless sensor networks; power system optimization; swarm intelligence in image and video processing; applications of swarm intelligence to management problems; swarm intelligence for real-world application.

**Swarm Intelligence and Bio-Inspired Computation**-Simon Fong

2013-05-16 Data mining has evolved from methods of simple statistical analysis to complex pattern recognition in the past decades. During the progression, the data mining algorithms are modified or extended in order to overcome some specific problems. This chapter discusses about the prospects of improving data mining algorithms by integrating bio-inspired optimization, which has lately captivated much of researchers' attention. In particular, high dimensionality and the unavailability of the whole data set (as in stream mining) in the training data have known to be two major challenges. We demonstrated that these two challenges, through two small examples such as K-means clustering and time-series classification, can be overcome by integrating data mining and bio-inspired algorithms.

**Nature-inspired Methods for Stochastic, Robust and Dynamic Optimization**-Javier Del Ser Lorente 2018-07-18

Nature-inspired algorithms have a great popularity in the current scientific community, being the focused scope of many research contributions in the literature year by year. The rationale behind the acquired momentum by this broad family of methods lies on their outstanding performance evinced in hundreds of research fields and problem instances. This book gravitates on the development of nature-inspired methods and their application to

stochastic, dynamic and robust optimization. Topics covered by this book include the design and development of evolutionary algorithms, bio-inspired metaheuristics, or memetic methods, with empirical, innovative findings when used in different subfields of mathematical optimization, such as stochastic, dynamic, multimodal and robust optimization, as well as noisy optimization and dynamic and constraint satisfaction problems.

### **Recent Advances in Swarm Intelligence and Evolutionary**

**Computation**-Xin-She Yang 2014-12-27 This timely review volume summarizes the state-of-the-art developments in nature-inspired algorithms and applications with the emphasis on swarm intelligence and bio-inspired computation. Topics include the analysis and overview of swarm intelligence and evolutionary computation, hybrid metaheuristic algorithms, bat algorithm, discrete cuckoo search, firefly algorithm, particle swarm optimization, and harmony search as well as convergent hybridization. Application case studies have focused on the dehydration of fruits and vegetables by the firefly algorithm and goal programming, feature selection by the binary flower pollination algorithm, job shop scheduling, single row facility layout optimization, training of feed-forward neural networks, damage and stiffness identification, synthesis of cross-ambiguity functions by the bat algorithm, web document clustering, truss analysis, water distribution networks, sustainable building designs and others. As a timely review, this book can serve as an ideal reference for graduates, lecturers, engineers and researchers in computer science, evolutionary computing, artificial intelligence, machine learning, computational intelligence, data mining, engineering optimization and designs.

### **Artificial Intelligence**-Marco Antonio Aceves-Fernandez 2018-06-27

Artificial intelligence (AI) is taking an increasingly important role in our society. From cars, smartphones, airplanes, consumer applications, and even medical equipment, the impact of AI is changing the world around us. The ability of machines to demonstrate advanced cognitive skills in taking decisions, learn and perceive the environment, predict certain behavior, and process written or spoken languages, among other skills, makes this discipline of paramount importance in today's world. Although AI is

changing the world for the better in many applications, it also comes with its challenges. This book encompasses many applications as well as new techniques, challenges, and opportunities in this fascinating area.

### **Swarm Intelligence and Bio-Inspired Computation**-Amir Hossein

Gandomi 2013-05-16 A new metaheuristic optimization algorithm, called krill herd (KH), has been recently proposed by Gandomi and Alavi. In this study, KH is introduced for structural optimization. For more verification, KH is subsequently applied to three design problems reported in the literature. The performance of the KH algorithm is further compared with various algorithms representative of the state of the art in the area. The comparisons show that the results obtained by KH can be better than the best solutions obtained by the existing methods in these three case studies.

### **Particle Swarm Optimization with Applications**-Pakize Erdogmus

2018-05-30 This book is intended to gather recent studies on particle swarm optimization (PSO). In this book, readers can find the recent theoretical developments and applications on PSO algorithm. From the theoretical aspect, PSO has preserved its popularity because of the fast convergence rate, and a lot of hybrid algorithms have recently been developed in order to increase the performance of the algorithm. At the same time, PSO has also been used to solve different kinds of engineering optimization problems. In this book, a reader can find engineering applications of PSO, such as environmental economic dispatch and grid computing.

### **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 as a source of inspiration for new applications. Researchers and engineers as well as experienced experts will also find it a handy reference. Discusses and summarizes the latest developments in nature-inspired algorithms with comprehensive, timely literature Provides a theoretical understanding as well as practical implementation hints Provides a step-by-step introduction to each algorithm

### **Bio-inspired Computing: Theories and Applications**-Linqiang Pan

**Swarm Intelligence**-Eric Bonabeau 1999-09-23 Social insects--ants, bees, termites, and wasps--can be viewed as powerful problem-solving systems with sophisticated collective intelligence. Composed of simple interacting agents, this intelligence lies in the networks of interactions among individuals and between individuals and the environment. A fascinating subject, social insects are also a powerful metaphor for artificial intelligence, and the problems they solve--finding food, dividing labor among nestmates, building nests, responding to external challenges--have important counterparts in engineering and computer science. This book provides a detailed look at models of social insect behavior and how to apply these models in the design of complex systems. The book shows how these models replace an emphasis on control, preprogramming, and centralization with designs featuring autonomy, emergence, and distributed functioning. These designs are proving immensely flexible and robust, able to adapt quickly to changing environments and to continue functioning even when individual elements fail. In particular, these designs are an exciting approach to the tremendous growth of complexity in software and information. Swarm Intelligence draws on up-to-date research from biology, neuroscience, artificial intelligence, robotics, operations research, and computer graphics, and each chapter is organized around a particular biological example, which is then used to develop an algorithm, a multiagent system, or a group of robots. The book will be an invaluable resource for a broad range of disciplines.

### **Bio-Inspired Computing for Image and Video Processing**-D. P.

Acharjya 2018-01-02 In recent years bio-inspired computational theories and tools have developed to assist people in extracting knowledge from high dimensional data. These differ in how they take a more evolutionary approach to learning, as opposed to traditional artificial intelligence (AI) and what could be described as 'creationist' methods. Instead bio-inspired computing takes a bottom-up, de-centralized approach that often involves the method of specifying a set of simple rules, a set of simple organisms which adhere to those rules, and of iteratively applying those rules. Bio-Inspired Computing for Image and Video Processing covers interesting and challenging new theories in image and video processing. It addresses the growing demand for image and video processing in diverse application areas, such as secured biomedical imaging, biometrics, remote sensing, texture understanding, pattern recognition, content-based image retrieval, and more. This book is perfect for students following this topic at both undergraduate and postgraduate level. It will also prove indispensable to researchers who have an interest in image processing using bio-inspired computing.

### **Handbook of Research on Soft Computing and Nature-Inspired Algorithms**-Shandilya, Shishir K. 2017-03-10

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

### **Nature-Inspired Computing and Optimization**-Srikanta Patnaik

2017-03-07 The book provides readers with a snapshot of the state of the art in the field of nature-inspired computing and its application in optimization. The approach is mainly practice-oriented: each bio-inspired technique or algorithm is introduced together with one of its possible applications. Applications cover a wide range of real-world optimization problems: from feature selection and image enhancement to scheduling and dynamic resource management, from wireless sensor networks and wiring network diagnosis to sports training planning and gene expression, from topology control and morphological filters to nutritional meal design and antenna array design. There are a few theoretical chapters comparing different existing techniques, exploring the advantages of nature-inspired computing over other methods, and investigating the mixing time of genetic algorithms. The book also introduces a wide range of algorithms, including the ant colony optimization, the bat algorithm, genetic algorithms, the collision-based optimization algorithm, the flower pollination algorithm, multi-agent systems and particle swarm optimization. This timely book is intended as a practice-oriented reference guide for students, researchers and professionals.

### **Swarm Intelligence for Cloud Computing**-Indrajit Pan 2020-07-19

Swarm Intelligence in Cloud Computing is an invaluable treatise for researchers involved in delivering intelligent optimized solutions for reliable deployment, infrastructural stability, and security issues of cloud-based resources. Starting with a bird's eye view on the prevalent state-of-the-art techniques, this book enriches the readers with the knowledge of evolving swarm intelligent optimized techniques for addressing different cloud computing issues including task scheduling, virtual machine allocation, load balancing and optimization, deadline handling, power-aware profiling, fault resilience, cost-effective design, and energy efficiency. The book offers comprehensive coverage of the most essential topics, including: Role of swarm intelligence on cloud computing services Cloud resource sharing strategies Cloud service provider selection Dynamic task and resource scheduling Data center resource management. Indrajit Pan is an Associate Professor in Information Technology of RCC Institute of Information Technology, India. He received his PhD from Indian Institute of Engineering Science and Technology, Shibpur, India. With an academic experience of 14 years, he has published around 40 research publications in different

international journals, edited books, and conference proceedings. Mohamed Abd Elaziz is a Lecturer in the Mathematical Department of Zagazig University, Egypt. He received his PhD from the same university. He is the author of more than 100 articles. His research interests include machine learning, signal processing, image processing, cloud computing, and evolutionary algorithms. Siddhartha Bhattacharyya is a Professor in Computer Science and Engineering of Christ University, Bangalore. He received his PhD from Jadavpur University, India. He has published more than 230 research publications in international journals and conference proceedings in his 20 years of academic experience.

### **Handbook of Research on Advancements of Swarm Intelligence Algorithms for Solving Real-World Problems**-Cheng, Shi 2020-04-24

The use of optimization algorithms has seen an emergence in various professional fields due to its ability to process data and information in an efficient and productive manner. Combining computational intelligence with these algorithms has created a trending subject of research on how much more beneficial intelligent-inspired algorithms can be within companies and organizations. As modern theories and applications are continually being developed in this area, professionals are in need of current research on how intelligent algorithms are advancing in the real world. The Handbook of Research on Advancements of Swarm Intelligence Algorithms for Solving Real-World Problems is a pivotal reference source that provides vital research on the development of swarm intelligence algorithms and their implementation into current issues. While highlighting topics such as multi-agent systems, bio-inspired computing, and evolutionary programming, this publication explores various concepts and theories of swarm intelligence and outlines future directions of development. This book is ideally designed for IT specialists, researchers, academicians, engineers, developers, practitioners, and students seeking current research on the real-world applications of intelligent algorithms.

### **Nature-Inspired Computing: Concepts, Methodologies, Tools, and Applications**-Management Association, Information Resources 2016-07-26

As technology continues to become more sophisticated, mimicking natural

processes and phenomena also becomes more of a reality. Continued research in the field of natural computing enables an understanding of the world around us, in addition to opportunities for man-made computing to mirror the natural processes and systems that have existed for centuries. *Nature-Inspired Computing: Concepts, Methodologies, Tools, and Applications* takes an interdisciplinary approach to the topic of natural computing, including emerging technologies being developed for the purpose of simulating natural phenomena, applications across industries, and the future outlook of biologically and nature-inspired technologies. Emphasizing critical research in a comprehensive multi-volume set, this publication is designed for use by IT professionals, researchers, and graduate students studying intelligent computing.

#### **Computational Vision and Bio-Inspired Computing**-S. Smys 2020-01-06

This proceedings book presents state-of-the-art research innovations in computational vision and bio-inspired techniques. Due to the rapid advances in the emerging information, communication and computing technologies, the Internet of Things, cloud and edge computing, and artificial intelligence play a significant role in the computational vision context. In recent years, computational vision has contributed to enhancing the methods of controlling the operations in biological systems, like ant colony optimization, neural networks, and immune systems. Moreover, the ability of computational vision to process a large number of data streams by implementing new computing paradigms has been demonstrated in numerous studies incorporating computational techniques in the emerging bio-inspired models. The book reveals the theoretical and practical aspects of bio-inspired computing techniques, like machine learning, sensor-based models, evolutionary optimization, and big data modeling and management, that make use of effectual computing processes in the bio-inspired systems. As such it contributes to the novel research that focuses on developing bio-inspired computing solutions for various domains, such as human-computer interaction, image processing, sensor-based single processing, recommender systems, and facial recognition, which play an indispensable part in smart agriculture, smart city, biomedical and business intelligence applications.

**Swarm Intelligence**-Aboul Ella Hassanien 2018-09-03 *Swarm Intelligence: Principles, Advances, and Applications* delivers in-depth coverage of bat, artificial fish swarm, firefly, cuckoo search, flower pollination, artificial bee colony, wolf search, and gray wolf optimization algorithms. The book begins with a brief introduction to mathematical optimization, addressing basic concepts related to swarm intelligence, such as randomness, random walks, and chaos theory. The text then: Describes the various swarm intelligence optimization methods, standardizing the variants, hybridizations, and algorithms whenever possible Discusses variants that focus more on binary, discrete, constrained, adaptive, and chaotic versions of the swarm optimizers Depicts real-world applications of the individual optimizers, emphasizing variable selection and fitness function design Details the similarities, differences, weaknesses, and strengths of each swarm optimization method Draws parallels between the operators and searching manners of the different algorithms *Swarm Intelligence: Principles, Advances, and Applications* presents a comprehensive treatment of modern swarm intelligence optimization methods, complete with illustrative examples and an extendable MATLAB® package for feature selection in wrapper mode applied on different data sets with benchmarking using different evaluation criteria. The book provides beginners with a solid foundation of swarm intelligence fundamentals, and offers experts valuable insight into new directions and hybridizations.

**Swarm Intelligence**-James Haywood Rolling, Jr. 2013-11-26 Companies and organizations everywhere cite creativity as the most desirable - and elusive - leadership quality of the future. Yet scores measuring creativity among American children have been on the wane for decades. A specialist in creative leadership, professor James Haywood Rolling, Jr. knows firsthand that the classroom is a key to either unlocking or blocking the critical imagination. He argues that today's schools, with their focus on rote learning and test-taking, work to stymie creativity, leaving children cut off from their natural impulses and boxed in by low expectations. Drawing on cutting-edge research in the realms of biological swarm theory, systems theory, and complexity theory, Rolling shows why group collaboration and adaptive social networking make us both smarter and more creative, and how we can design education and workplace practices around these natural principles, instead of pushing a limited focus on individual achievement that

serves neither children nor their future colleagues, managers and mentors. The surprising truth is that the future will be pioneered by the collective problem-solvers, making Swarm Intelligence a must-read for business leaders, educators, and anyone else concerned with nurturing creative intelligence and innovative habits in today's youth.

**Mobile Ad Hoc Networks**-G Ram Mohana Reddy 2016-08-19 In recent years, a lot of work has been done in an effort to incorporate Swarm Intelligence (SI) techniques in building an adaptive routing protocol for Mobile Ad Hoc Networks (MANETs). Since centralized approach for routing in MANETs generally lacks in scalability and fault-tolerance, SI techniques provide a natural solution through a distributed approach for the adaptive routing for MANETs. In SI techniques, the captivating features of insects or mammals are correlated with the real world problems to find solutions. Recently, several applications of bio-inspired and nature-inspired algorithms in telecommunications and computer networks have achieved remarkable success. The main aims/objectives of this book, "Mobile Ad Hoc Networks: Bio-Inspired Quality of Service Aware Routing Protocols", are twofold; firstly it clearly distinguishes between principles of traditional routing protocols and SI based routing protocols, while explaining in detail the analogy between MANETs and SI principles. Secondly, it presents the readers with important Quality of Service (QoS) parameters and explains how SI based routing protocols achieves QoS demands of the applications. This book also gives quantitative and qualitative analysis of some of the SI based routing protocols for MANETs.

**Nature-Inspired Computing**-Nazmul H. Siddique 2017-05-19 Nature-Inspired Computing: Physics and Chemistry-Based Algorithms provides a comprehensive introduction to the methodologies and algorithms in nature-inspired computing, with an emphasis on applications to real-life engineering problems. The research interest for Nature-inspired Computing has grown considerably exploring different phenomena observed in nature and basic principles of physics, chemistry, and biology. The discipline has reached a mature stage and the field has been well-established. This endeavour is another attempt at investigation into various computational schemes inspired from nature, which are presented in this book with the

development of a suitable framework and industrial applications. Designed for senior undergraduates, postgraduates, research students, and professionals, the book is written at a comprehensible level for students who have some basic knowledge of calculus and differential equations, and some exposure to optimization theory. Due to the focus on search and optimization, the book is also appropriate for electrical, control, civil, industrial and manufacturing engineering, business, and economics students, as well as those in computer and information sciences. With the mathematical and programming references and applications in each chapter, the book is self-contained, and can also serve as a reference for researchers and scientists in the fields of system science, natural computing, and optimization.

**Clever Algorithms**-Jason Brownlee 2011-01 This book provides a handbook of algorithmic recipes from the fields of Metaheuristics, Biologically Inspired Computation and Computational Intelligence that have been described in a complete, consistent, and centralized manner. These standardized descriptions were carefully designed to be accessible, usable, and understandable. Most of the algorithms described in this book were originally inspired by biological and natural systems, such as the adaptive capabilities of genetic evolution and the acquired immune system, and the foraging behaviors of birds, bees, ants and bacteria. An encyclopedic algorithm reference, this book is intended for research scientists, engineers, students, and interested amateurs. Each algorithm description provides a working code example in the Ruby Programming Language.

**Efficient Learning Machines**-Mariette Awad 2015-04-27 Machine learning techniques provide cost-effective alternatives to traditional methods for extracting underlying relationships between information and data and for predicting future events by processing existing information to train models. Efficient Learning Machines explores the major topics of machine learning, including knowledge discovery, classifications, genetic algorithms, neural networking, kernel methods, and biologically-inspired techniques. Mariette Awad and Rahul Khanna's synthetic approach weaves together the theoretical exposition, design principles, and practical applications of efficient machine learning. Their experiential emphasis,

expressed in their close analysis of sample algorithms throughout the book, aims to equip engineers, students of engineering, and system designers to design and create new and more efficient machine learning systems. Readers of *Efficient Learning Machines* will learn how to recognize and analyze the problems that machine learning technology can solve for them, how to implement and deploy standard solutions to sample problems, and how to design new systems and solutions. Advances in computing performance, storage, memory, unstructured information retrieval, and cloud computing have coevolved with a new generation of machine learning paradigms and big data analytics, which the authors present in the conceptual context of their traditional precursors. Awad and Khanna explore current developments in the deep learning techniques of deep neural networks, hierarchical temporal memory, and cortical algorithms. Nature suggests sophisticated learning techniques that deploy simple rules to generate highly intelligent and organized behaviors with adaptive, evolutionary, and distributed properties. The authors examine the most popular biologically-inspired algorithms, together with a sample application to distributed datacenter management. They also discuss machine learning techniques for addressing problems of multi-objective optimization in which solutions in real-world systems are constrained and evaluated based on how well they perform with respect to multiple objectives in aggregate. Two chapters on support vector machines and their extensions focus on recent improvements to the classification and regression techniques at the core of machine learning.

**Nature Inspired Computing for Wireless Sensor Networks**-Debashis De 2020-02-01 This book presents nature inspired computing applications for the wireless sensor network (WSN). Although the use of WSN is increasing rapidly, it has a number of limitations in the context of battery issue, distraction, low communication speed, and security. This means there is a need for innovative intelligent algorithms to address these issues. The book is divided into three sections and also includes an introductory chapter providing an overview of WSN and its various applications and algorithms as well as the associated challenges. Section 1 describes bio-inspired optimization algorithms, such as genetic algorithms (GA), artificial neural networks (ANN) and artificial immune systems (AIS) in the contexts of fault analysis and diagnosis, and traffic management. Section 2 highlights swarm optimization techniques, such as African buffalo optimization (ABO), particle swarm optimization (PSO), and modified swarm intelligence technique for solving the problems of routing, network parameters optimization, and energy estimation. Lastly, Section 3 explores multi-objective optimization techniques using GA, PSO, ANN, teaching-learning-based optimization (TLBO), and combinations of the algorithms presented. As such, the book provides efficient and optimal solutions for WSN problems based on nature-inspired algorithms.