



# SWARM INTELLIGENCE

Principles, Advances, and Applications

Aboul Ella Hassanien  
Eid Emam



CRC Press  
Taylor & Francis Group

# Swarm Intelligence Principles Advances Applications

**Patrick Siarry,Lhassane  
Idoumghar,Julien Lepagnot**

## **Swarm Intelligence Principles Advances Applications:**

Swarm Intelligence Aboul Ella Hassanien,Eid Emary,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

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**Innovative Computing, Optimization and Its Applications** Ivan Zelinka,Pandian Vasant,Vo Hoang Duy,Tran Trong Dao,2017-11-20 This book presents the latest research of the field of optimization modeling and algorithms discussing the real world application problems associated with new innovative methodologies The requirements and demands of problem solving have been increasing exponentially and new

computer science and engineering technologies have reduced the scope of data coverage worldwide The recent advances in information communication technology ICT have contributed to reducing the gaps in the coverage of domains around the globe The book is a valuable reference work for researchers in the fields of computer science and engineering with a particular focus on modeling simulation and optimization as well as for postgraduates managers economists and decision makers *A Primer on Multiple Intelligences* Matthew N. O. Sadiku,Sarhan M. Musa,2021-07-24 This book provides an introduction to nineteen popular multiple intelligences Part One discusses general intelligence psychological testing naturalistic intelligence social intelligence emotional intelligence interpersonal intelligence and cultural intelligence Part Two tackles machine intelligence the development of artificial intelligence computational intelligence and digital intelligence or the ability for humans to adapt to a digital environment Finally Part Three discusses the role of intelligence in business development using technology to augment intelligence abstract thinking swarm and animal intelligence military intelligence and musical intelligence A Primer on Multiple Intelligences is a must read for graduate students or scholars considering researching cognition perception motivation and artificial intelligence It will also be of use to those in social psychology computer science and pedagogy It is as a valuable resource for anyone interested in learning more about the multifaceted study of intelligence

**Collective Intelligence** Uwe Seebacher,Christoph Legat,2024-11-14 Unlock the future of technology with this captivating exploration of swarm intelligence Dive into the future of autonomous systems enhanced by cutting edge multi agent systems and predictive research Real world examples illustrate how these algorithms drive intelligent coordinated behavior in industries like manufacturing and energy Discover the innovative Industrial Disruption Index IDI pioneered by Uwe Seebacher which predicts industry disruptions using swarm intelligence Case studies from media to digital imaging offer invaluable insights into the future of industrial life cycles Ideal for AI enthusiasts and professionals this book provides inspiring actionable insights for the future It redefines artificial intelligence showcasing how predictive intelligence can revolutionize group coordination for more efficient and sustainable systems A crucial chapter highlights the shift from the Green Deal to the Emerald Deal showing how swarm intelligence addresses societal challenges

*Machine Learning Paradigms: Theory and Application* Aboul Ella Hassanien,2018-12-08 The book focuses on machine learning Divided into three parts the first part discusses the feature selection problem The second part then describes the application of machine learning in the classification problem while the third part presents an overview of real world applications of swarm based optimization algorithms The concept of machine learning ML is not new in the field of computing However due to the ever changing nature of requirements in today s world it has emerged in the form of completely new avatars Now everyone is talking about ML based solution strategies for a given problem set The book includes research articles and expository papers on the theory and algorithms of machine learning and bio inspiring optimization as well as papers on numerical experiments and real world applications

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Computing Systems in Designing Data Solutions Sarvesh Pandey,Udai Shanker,Vijayalakshmi Saravanan,Rajinikumar Ramalingam,2023-01-25 This book discusses the application of data systems and data driven infrastructure in existing industrial systems in order to optimize workflow utilize hidden potential and make existing systems free from vulnerabilities The book discusses application of data in the health sector public transportation the financial institutions and in battling natural disasters among others Topics include real time applications in the current big data perspective improving security in IoT devices data backup techniques for systems artificial intelligence based outlier prediction machine learning in OpenFlow Network and application of deep learning in blockchain enabled applications This book is intended for a variety of readers from professional industries organizations and students     *Handbook of Research on Machine Learning Innovations and Trends* Hassanien, Aboul Ella,Gaber, Tarek,2017-04-03 Continuous improvements in technological applications have allowed more opportunities to develop automated systems This not only leads to higher success in smart data analysis but it increases the overall probability of technological progression The Handbook of Research on Machine Learning Innovations and Trends is a key resource on the latest advances and research regarding the vast range of advanced systems and applications involved in machine intelligence Highlighting multidisciplinary studies on decision theory intelligent search and multi agent systems this publication is an ideal reference source for professionals and researchers working in the field of machine learning and its applications     Smart Computer Vision B. Vinoth Kumar,P. Sivakumar,B. Surendiran,Junhua Ding,2023-02-27 This book addresses and disseminates research and development in the applications of intelligent techniques for computer vision the field that works on enabling computers to see identify and process images in the same way that human vision does and then providing appropriate output The book provides contributions which include theory case studies and intelligent techniques pertaining to computer vision applications The book helps readers grasp the essence of the recent advances in this complex field The audience includes researchers professionals practitioners and students from academia and industry who work in this interdisciplinary field The authors aim to inspire future research both from theoretical and practical viewpoints to spur further advances in the field     *Deep Learning for Medical Decision Support Systems* Utku Kose,Omer Deperlioglu,Jafar Alzubi,Bogdan Patrut,2020-06-17 This book explores various applications of deep learning oriented diagnosis leading to decision support while also outlining the future face of medical decision support systems Artificial intelligence has now become a ubiquitous aspect of modern life and especially machine learning enjoys great popularity since it offers techniques that are capable of learning from samples to solve newly encountered cases Today a recent form of machine learning deep learning is being widely used with large complex quantities of data because today's problems require detailed analyses of more data This is critical especially in fields such as medicine Accordingly the objective of this book is to provide the essentials of and highlight recent applications of deep learning architectures for medical decision support systems The target audience includes scientists experts MSc and PhD students postdocs and any

readers interested in the subjectsdiscussed The book canbe used as a reference work to support courses on artificial intelligence machine deep learning medical and biomedicaleducation ***Swarm Intelligence*** Christian Blum,Daniel Merkle,2008-09-24 Swarm intelligence is a modern arti cial intelligence discipline that is c erner with the design of multiagent systems with applications e g in timization and in robotics The design paradigm for these systems is fun mentally di erent from more traditional approaches Instead of a sophisticated controller that governs the global behavior of the system the swarm intelligence principle is based on many unsophisticated entities that cooperate in order to exhibit a desired behavior Inspiration for the design of these systems is taken from the collective behavior of social insects such as ants termites bees and wasps as well as from the behavior of otheranimalsocietessuchas ocksofbirdsorschoolsof sh Coloniesofsocial insects have mesmerized researchers for many years However the principles that govern their behavior remained unknown for a long time Even though the single members of these societies are unsophisticated individuals they are able to achieve complex tasks in cooperation Coordinated behavior emerges from relatively simple actions or interactions between the individuals ***Swarm Intelligence*** Abhishek Sharma,Abhinav Sharma,Jitendra Kumar Pandey,Mangey Ram,2022-02-01 Swarm intelligence is one of the fastest growing subfields of artificial intelligence and soft computing This field includes multiple optimization algorithms to solve NP hard problems for which conventional methods are not effective It inspires researchers in engineering sciences to learn theories from nature and incorporate them Swarm Intelligence Foundation Principles and Engineering Applications provides a comprehensive review of new swarm intelligence techniques and offers practical implementation of Particle Swarm Optimization PSO with MATLAB code The book discusses the statistical analysis of swarm optimization techniques so that researchers can analyse their experiment design It also includes algorithms in social sectors oil and gas industries and recent research findings of new optimization algorithms in the field of engineering describing the implementation in machine learning This book is written for students of engineering research scientists and academicians involved in the engineering sciences ***Swarm Intelligence*** ,2019-12-04 Swarm Intelligence has emerged as one of the most studied artificial intelligence branches during the last decade constituting the fastest growing stream in the bio inspired computation community A clear trend can be deduced analyzing some of the most renowned scientific databases available showing that the interest aroused by this branch has increased at a notable pace in the last years This book describes the prominent theories and recent developments of Swarm Intelligence methods and their application in all fields covered by engineering This book unleashes a great opportunity for researchers lecturers and practitioners interested in Swarm Intelligence optimization problems and artificial intelligence ***Swarm Intelligence Based Optimization*** Patrick Siarry,Lhassane Idoumghar,Julien Lepagnot,2014-11-27 This book constitutes the thoroughly refereed post conference proceedings of the 1st International Conference on Swarm Intelligence Based Optimization ICSIBO 2014 held in Mulhouse France in May 2014 The 20 full papers presented were carefully reviewed and selected from 48

submissions Topics of interest presented and discussed in the conference focuses on the theoretical progress of swarm intelligence metaheuristics and their applications in areas such as theoretical advances of swarm intelligence metaheuristics combinatorial discrete binary constrained multi objective multi modal dynamic noisy and large scale optimization artificial immune systems particle swarms ant colony bacterial foraging artificial bees fireflies algorithm hybridization of algorithms parallel distributed computing machine learning data mining data clustering decision making and multi agent systems based on swarm intelligence principles adaptation and applications of swarm intelligence principles to real world problems in various domains *Advances in Applied Artificial Intelligence* John Fulcher,2006 This book explores artificial intelligence finding it cannot simply display the high level behaviours of an expert but must exhibit some of the low level behaviours common to human existence Provided by publisher **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

*Multi-objective Swarm Intelligence* Satchidananda Dehuri,Alok Kumar Jagadev,Mrutyunjaya Panda,2015-03-10 The aim of this book is to understand the state of the art theoretical and practical advances of swarm intelligence It comprises seven contemporary relevant chapters In chapter 1 a review of Bacteria Foraging Optimization BFO techniques for both single and multiple criterions problem is presented A survey on swarm intelligence for multiple and many objectives optimization is presented in chapter 2 along with a topical study on EEG signal analysis Without compromising the extensive simulation study a comparative study of variants of MOPSO is provided in chapter 3 Intractable problems like subset and job scheduling problems are discussed in chapters 4 and 7 by different hybrid swarm intelligence techniques An attempt to study image enhancement by ant colony optimization is made in chapter 5 Finally chapter 7 covers the aspect of uncertainty in data by hybrid PSO **Advances in Swarm Intelligence** Anupam Biswas,Can B. Kalayci,Seyedali Mirjalili,2022-10-01 Swarm Intelligence SI has grown significantly both from the perspective of algorithmic development and applications covering

almost all disciplines science and technology This book emphasizes the studies of existing SI techniques their variants and applications The book also contains reviews of new developments in SI techniques and hybridizations Algorithm specific studies covering basic introduction and analysis of key components of these algorithms such as convergence balance of solution accuracy computational costs tuning and control of parameters Application specific studies incorporating the ways of designing objective functions solution representation and constraint handling The book also includes studies on application domain specific adaptations in the SI techniques The book will be beneficial for academicians and researchers from various disciplines of engineering and science working in applications of SI and other optimization problems

**Advances in Swarm Intelligence for Optimizing Problems in Computer Science** Anand Nayyar,Dac-Nhuong Le,Nhu Gia Nguyen,2018-10-03

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

*Critical Developments and Applications of Swarm Intelligence* Shi, Yuhui,2018-02-28 Artificial intelligence is a constantly advancing field that requires models in order to accurately create functional systems The use of natural acumen to create artificial intelligence creates a field of research in which the natural and the artificial meet in a new and innovative way Critical Developments and Applications of Swarm Intelligence is a critical academic publication that examines developing research technologies and function regarding natural and artificial acumen specifically in regards to self organized systems Featuring coverage on a broad range of topics such as evolutionary algorithms optimization techniques and computational comparison this book is geared toward academicians students researchers and engineers seeking relevant and current research on the progressive research based on the implementation of swarm intelligence in self organized systems

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