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Membrane Computing in Optimization

From Biology to Algorithms



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Membrane Computing In Optimization From Biology To Algorithms

Clara Pizzuti, Annalisa Socievole



Membrane Computing In Optimization From Biology To Algorithms:

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 Computing: Theories and Applications Linqiang Pan, Dongming Zhao, Lianghao Li, Jianqing Lin, 2023-04-17 This book constitutes the refereed proceedings of the 17th International Conference on Bio Inspired Computing Theories and Applications BIC TA 2022 held in Wuhan China during December 16 18 2022 The 56 full papers included in this book were carefully reviewed and selected from 148 submissions They were organized in topical sections as follows evolutionary computation and swarm intelligence

machine learning and deep learning intelligent control and simulation and molecular computing and nanotechnology

Formal Methods for Computational Systems Biology Marco Bernardo, Pierpaolo Degano, Gianluigi Zavattaro, 2008-05-31

This book presents a set of 14 papers accompanying the lectures of leading researchers given at the 8th edition of the International School on Formal Methods for the Design of Computer Communication and Software Systems SFM 2008 held in Bertinoro Italy in June 2008 SFM 2008 was devoted to formal techniques for computational systems biology and covered several aspects of the field including computational models calculi and logics for biological systems and verification and simulation methods The first part of this volume comprises nine papers based on regular lectures the second part of this volume comprises five papers based on talks given by people involved in the Italian BISCA research project on Bio Inspired Systems and Calculi with Applications

Innovative Computational Intelligence: A Rough Guide to 134 Clever Algorithms Bo Xing, Wen-Jing Gao, 2013-12-13 The first notable feature of this book is its innovation Computational intelligence CI a fast evolving area is currently attracting lots of researchers attention in dealing with many complex problems At present there are quite a lot competing books existing in the market Nevertheless the present book is markedly different from the existing books in that it presents new paradigms of CI that have rarely mentioned before as opposed to the traditional CI techniques or methodologies employed in other books During the past decade a number of new CI algorithms are proposed Unfortunately they spread in a number of unrelated publishing directions which may hamper the use of such published resources These provide us with motivation to analyze the existing research for categorizing and synthesizing it in a meaningful manner The mission of this book is really important since those algorithms are going to be a new revolution in computer science We hope it will stimulate the readers to make novel contributions or even start a new paradigm based on nature phenomena Although structured as a textbook the book s straightforward self contained style will also appeal to a wide audience of professionals researchers and independent learners We believe that the book will be instrumental in initiating an integrated approach to complex problems by allowing cross fertilization of design principles from different design philosophies The second feature of this book is its comprehensiveness Through an extensive literature research there are 134 innovative CI algorithms covered in this book

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 Nature-Inspired Intelligent Computing Techniques in Bioinformatics Khalid Raza,2022-10-31 This book encapsulates and occupies recent advances and state of the art applications of nature inspired computing NIC techniques in the field of bioinformatics and computational biology which would aid medical sciences in various clinical applications This edited volume covers fundamental applications scope and future perspectives of NIC techniques in bioinformatics including genomic profiling gene expression data classification DNA computation systems and network biology solving personalized therapy complications antimicrobial resistance in bacterial pathogens and computer aided drug design discovery and therapeutics It also covers the role of NIC techniques in various diseases and disorders including cancer detection and diagnosis breast cancer lung disorder detection disease biomarkers and potential therapeutics identifications Bio-inspired Computing: Theories and Applications Cheng He,Hongwei Mo,Linqiang Pan,Yuxin Zhao,2017-11-10 This book constitutes the proceedings of the 12th International Conference on Bio inspired Computing Theories and Applications BIC TA 2017 held in Harbin China December 2017 The 50 full papers presented were selected from 143 submissions The papers deal with studies abstracting computing ideas such as data structures operations with data ways to control operations computing models from living phenomena or biological systems such as evolution cells tissues neural networks immune systems and ant colonies **Bio-inspired Computing - Theories and Applications** Maoguo Gong,Linqiang Pan,Tao Song,Gexiang Zhang,2017-01-07 The two volume set CCIS 681 and CCIS 682 constitutes the proceedings of the 11th International Conference on Bio Inspired Computing Theories and Applications BIC TA 2016 held in Xi an China in October 2016 The 115 revised full papers presented were carefully reviewed and selected from 343 submissions The papers of Part I are organized in topical sections on DNA Computing Membrane Computing Neural Computing Machine Learning The papers of Part II are organized in topical sections on Evolutionary Computing Multi objective Optimization Pattern Recognition Others Biological Computation Ehud Lamm,Ron Unger,2011-05-25 The area of biologically inspired computing or biological computation involves the development of new biologically based techniques for solving difficult computational problems A unified overview of computer science ideas inspired by biology Biological Computation presents the most fundamental and significant concepts in this area In the book students discover that bacteria communicate that DNA can be used for performing computations how evolution solves optimization problems that the way ants organize their nests can be applied to solve clustering problems and what the human immune system can teach us about protecting computer networks The authors discuss more biological examples such as these along with the computational techniques developed from these scenarios The text focuses on cellular automata evolutionary computation neural networks and molecular computation Each chapter explores the biological background describes the computational techniques gives

examples of applications discusses possible variants of the techniques and includes exercises and solutions The authors use the examples and exercises to illustrate key ideas and techniques Clearly conveying the essence of the major computational approaches in the field this book brings students to the point where they can either produce a working implementation of the techniques or effectively use one of the many available implementations Moreover the techniques discussed reflect fundamental principles that can be applied beyond bio inspired computing Supplementary material is available on Dr Unger s website

Computational Intelligence and Intelligent Systems Zhenhua Li,Xiang Li,Yong Liu,Zhihua Cai,2012-10-06

This book constitutes the refereed proceedings of the 6th International Symposium on Intelligence Computation and Applications ISICA 2012 held in Wuhan China in October 2012 The 72 revised full papers presented were carefully reviewed and selected from numerous submissions The papers are organized in topical sections on artificial life adaptive behavior agents and ant colony optimization combinatorial and numerical optimization communications and computer networks data mining evolutionary multi objective and dynamic optimization intelligent computation intelligent learning systems neural networks real world applications

Nature-Inspired Algorithms and Applications S. Balamurugan,Anupriya Jain,Sachin Sharma,Dinesh Goyal,Sonia Duggal,Seema Sharma,2021-12-14 NATURE INSPIRED ALGORITHMS AND APPLICATIONS The book s unified approach of balancing algorithm introduction theoretical background and practical implementation complements extensive literature with well chosen case studies to illustrate how these algorithms work Inspired by the world around them researchers are gathering information that can be developed for use in areas where certain practical applications of nature inspired computation and machine learning can be applied This book is designed to enhance the reader s understanding of this process by portraying certain practical applications of nature inspired algorithms NIAs specifically designed to solve complex real world problems in data analytics and pattern recognition by means of domain specific solutions Since various NIAs and their multidisciplinary applications in the mechanical engineering and electrical engineering sectors and in machine learning image processing data mining and wireless networks are dealt with in detail in this book it can act as a handy reference guide Among the subjects of the 12 chapters are A novel method based on TRIZ to map real world problems to nature problems Applications of cuckoo search algorithm for optimization problems Performance analysis of nature inspired algorithms in breast cancer diagnosis Nature inspired computation in data mining Hybrid bat genetic algorithm based novel optimal wavelet filter for compression of image data Efficiency of finding best solutions through ant colony optimization techniques Applications of hybridized algorithms and novel algorithms in the field of machine learning Audience Researchers and graduate students in mechanical engineering electrical engineering machine learning image processing data mining and wireless networks will find this book very useful

Prof. Jun Yeh, Tallinn University of Technology, Estonia,2014-07-07 amount of new knowledge every day We have to acknowledge that even the smartest people among us are incapable of familiarizing himself with all these new data Fortunately we are only required to

deal with a very small amount of that vast number in our work and life As those who devote himself to the field of information technology and management engineering I sincerely believe that it is our responsibility to make efforts to accelerate the advance of science in such fields The 2014 international Conference on Information Technology and Management Engineering thanks to the hard work of its committee will be held on April 26 and 27 in Hong Kong The ITME2014 covers a wide range of topics such as network protocols information theory and coding theory network security management theory project management public management knowledge management etc It is a great honor to us that numerous people from various countries including many famous experts and excellent researchers have shown their interest in this convention and submitted their latest studies to us as their support Among these studies we have selected about a hundred to be finally included in this proceeding after reviewing and discussing We believe that this collection of work will be of great value not only to the participants of ITME2014 but also to those who has a chance of meeting it The publication of this conference proceedings and the successful opening of ITME2014 owe its credit to a lot of people and institutions especially the ITME2014 committee the editors and DEStech Publications The committee has devoted much time to reviewing the papers submitted to ITME2014 and DEStech Publications publishing those accepted papers I would like to thank the committee and the press deeply here for their support to ITME2014 and I am eagerly looking forward to another chance for us to be a team again Finally let s wish together that the 2014 International Conference on Information Technology

Bio-inspired Computing Models And Algorithms Tao Song,Pan Zheng,Dennis Mou Ling Wong,Xun Wang,2019-04-05 Bio inspired computing BIC focuses on the designs and developments of computer algorithms and models based on biological mechanisms and living phenomena It is now a major subfield of natural computation that leverages on the recent advances in computer science biology and mathematics The ideas provide abundant inspiration to construct high performance computing models and intelligent algorithms thus enabling powerful tools to solve real life problems Written by world renowned researchers this compendium covers the most influential topics on BIC where the newly obtained algorithms developments and results are introduced and elaborated The potential and valuable directions for further research are addressed as well

Smart Buildings Digitalization, Two Volume Set O.V. Gnana Swathika,K. Karthikeyan,Sanjeevikumar Padmanaban,2022-05-27 A smart building is the state of art in building with features that facilitates informed decision making based on the available data through smart metering and IoT sensors This set provides useful information for developing smart buildings including significant improvement of energy efficiency implementation of operational improvements and targeting sustainable environment to create an effective customer experience It includes case studies from industrial results which provide cost effective solutions and integrates the digital SCADA solution Describes complete implication of smart buildings via industrial commercial and community platforms Systematically defines energy efficient buildings employing power consumption optimization techniques with inclusion of renewable energy sources Covers data centre and cyber security with excellent

data storage features for smart buildings Includes systematic and detailed strategies for building air conditioning and lighting Details smart building security propulsion This set is aimed at graduate students researchers and professionals in building systems architectural and electrical engineering

Membrane Computing for Distributed Control of Robotic Swarms: Emerging Research and Opportunities Florea, Andrei George,Buiu, Cătălin,2017-03-10 Developments in bio inspired computation have impacted multiple fields and created opportunities for new applications In recent years these techniques have been increasingly integrated into robotic systems Membrane Computing for Distributed Control of Robotic Swarms Emerging Research and Opportunities is an innovative reference source for the latest perspectives on biologically inspired computation techniques for robot design and control Highlighting a range of pivotal topics such as software engineering simulation tools and robotic security this book is ideally designed for researchers academics students and practitioners interested in the role of membrane computing in mobile robots

Computation in Complex Networks Clara Pizzuti,Annalisa Socievole,2021-09-02 Complex networks are one of the most challenging research focuses of disciplines including physics mathematics biology medicine engineering and computer science among others The interest in complex networks is increasingly growing due to their ability to model several daily life systems such as technology networks the Internet and communication chemical neural social political and financial networks The Special Issue Computation in Complex Networks of Entropy offers a multidisciplinary view on how some complex systems behave providing a collection of original and high quality papers within the research fields of Community detection Complex network modelling Complex network analysis Node classification Information spreading and control Network robustness Social networks Network medicine

Nature-inspired Metaheuristic Algorithms Sulabh Bansal,Apurna Tripathi,Shilpa Srivastava,Prem Prakash Vuppuluri,2025-06-10 This comprehensive text provides practical guidance for implementing nature inspired algorithms and metaheuristics in real life scenarios to solve complex optimization problems It further demonstrates how nature inspired metaheuristic algorithms have the potential to contribute to multiple United Nations sustainable development goals such as climate action clean energy and sustainable cities This book Discusses load balancing and demand response using nature inspired optimization techniques Presents energy efficient routing and scheduling energy management and optimization using metaheuristic algorithms Covers disease diagnosis and prognosis using metaheuristic algorithms drug discovery and development using nature inspired optimization techniques Explains waste reduction and recycling image processing and computer vision using nature inspired optimization techniques Illustrates medical image analysis and segmentation using Ant Colony optimization and Particle Swarm optimization techniques Nature inspired Metaheuristic Algorithms is primarily written for senior undergraduates graduate students and academic researchers in the fields of electrical engineering electronics and communication engineering computer engineering and information technology

Recent Metaheuristic Computation Schemes in Engineering Erik Cuevas,Alma Rodríguez,Avelina Alejo-Reyes,Carolina

Del-Valle-Soto,2021-02-04 This book includes two objectives The first goal is to present advances and developments which have proved to be effective in their application to several complex problems The second objective is to present the performance comparison of various metaheuristic techniques when they face complex optimization problems The material has been compiled from a teaching perspective Most of the problems in science engineering economics and other areas can be translated as an optimization or a search problem According to their characteristics some problems can be simple that can be solved by traditional optimization methods based on mathematical analysis However most of the problems of practical importance in engineering represent complex scenarios so that they are very hard to be solved by using traditional approaches Under such circumstances metaheuristic has emerged as the best alternative to solve this kind of complex formulations This book is primarily intended for undergraduate and postgraduate students Engineers and application developers can also benefit from the book contents since it has been structured so that each chapter can be read independently from the others and therefore only potential interesting information can be quickly available for solving an industrial problem at hand

Multimedia Sensor Networks Huadong Ma,Liang Liu,Hong Luo,2021-07-02 Sensor networks are an essential component of the Internet of Things IoT and Multimedia Sensor Networks MSNs are the most important emerging area in sensor networks However multimedia sensing is characterized by diversified modes large volumes of data considerable heterogeneity and complex computing as a result of which the theory and methods for traditional sensor networks can't be applied to MSNs Based on the authors years of systematic research on related theory and methods this book provides a comprehensive review of MSNs The coverage ranges from networked sensing and fusion based transmission to route discovery and in network computing The book presents the most important scientific discoveries and fundamental theories on MSNs while also exploring practical approaches and typical applications Given its scope it is especially suitable for students researchers and practitioners interested in understanding scientific problems involved in characterizing multimedia sensing features revealing the transmission mechanisms of MSNs and constructing efficient in network multimedia computing paradigms In this book readers will learn essential methods for achieving the optimal deployment of efficient and reliable transmission and timely information processing in MSNs

Machine Learning and Intelligent Communications Xuemai Gu,Gongliang Liu,Bo Li,2018-01-20 This two volume set constitutes the refereed post conference proceedings of the Second International Conference on Machine Learning and Intelligent Communications MLICOM 2017 held in Weihai China in August 2017 The 143 revised full papers were carefully selected from 225 submissions The papers are organized thematically in machine learning intelligent positioning and navigation intelligent multimedia processing and security intelligent wireless mobile network and security cognitive radio and intelligent networking intelligent internet of things intelligent satellite communications and networking intelligent remote sensing visual computing and three dimensional modeling green communication and intelligent networking intelligent ad hoc and

sensor networks intelligent resource allocation in wireless and cloud networks intelligent signal processing in wireless and optical communications intelligent radar signal processing intelligent cooperative communications and networking

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