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FUNDAMENTALS OF COMPUTATIONAL SWARM INTELLIGENCE

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Fundamentals Of Computational Swarm Intelligence

Akram Pasha, Syed Ziaur Rahman



Fundamentals Of Computational Swarm Intelligence:

Fundamentals of Computational Swarm Intelligence Andries P. Engelbrecht, 2005-12-16 Fundamentals of Computational Swarm Intelligence provides a comprehensive introduction to the new computational paradigm of Swarm Intelligence SI a field that emerged from biological research and is now picking up momentum within the computational research community Bio inspired systems are becoming increasingly important research areas for computer scientists engineers economists bioinformaticians operational researchers and many other disciplines This book introduces the reader to the mathematical models of social insects collective behaviour and shows how they can be used in solving optimization problems Focusing on the algorithmic implementation of models of swarm behavior this book Examines how social network structures are used to exchange information among individuals and how the aggregate behaviour of these individuals forms a powerful organism Introduces a compact summary of the formal theory of optimisation Outlines paradigms with relations to SI including genetic algorithms evolutionary programming evolutionary strategies cultural algorithms and co evolution Looks at the choreographic movements of birds in a flock as a basis for the Particle Swarm Optimization PSO models and provides an extensive treatment of different classes of PSO models Shows how the behaviour of ants can be used to implement Ant Colony Optimization ACO algorithms to solve real world problems including routing optimization structure optimization data mining and data clustering Considers different classes of optimization problems including multi objective optimization dynamic environments discrete and continuous search spaces constrained optimization and niching Includes an accompanying website containing Java classes and implementations of the different algorithms that can be used to test PSO and ACO algorithms <http://si.cs.up.ac.za> The interdisciplinary nature of this field will make Fundamentals of Computational Swarm Intelligence an essential resource for readers with diverse backgrounds In addition it will be an excellent reference for computer scientists practitioners in business or industry and researchers involved in the analysis design and simulation of multibody systems Advanced undergraduates and graduate students in artificial intelligence collective intelligence and engineering will also find this book an invaluable tool

Computational Intelligence in Bioinformatics Arpad

Kelemen, Ajith Abraham, 2008-01-03 Bioinformatics involve the creation and advancement of algorithms using techniques including computational intelligence applied mathematics and statistics informatics and biochemistry to solve biological problems usually on the molecular level This book deals with the application of computational intelligence in bioinformatics Addressing the various issues of bioinformatics using different computational intelligence approaches is the novelty of this edited volume

Handbook of Research on Swarm Intelligence in Engineering Bhattacharyya, Siddhartha, Dutta,

Paramartha, 2015-04-30 Swarm Intelligence has recently emerged as a next generation methodology belonging to the class of evolutionary computing As a result scientists have been able to explain and understand real life processes and practices that previously remained unexplored The Handbook of Research on Swarm Intelligence in Engineering presents the latest

research being conducted on diverse topics in intelligence technologies such as Swarm Intelligence Machine Intelligence Optical Engineering and Signal Processing with the goal of advancing knowledge and applications in this rapidly evolving field The enriched interdisciplinary contents of this book will be a subject of interest to the widest forum of faculties existing research communities and new research aspirants from a multitude of disciplines and trades

Foundations of Computational Intelligence Ajith Abraham,Aboul-Ella Hassanien,André Ponce de Leon F. de Carvalho,2009-04-30

Foundations of Computational Intelligence Volume 4 Bio Inspired Data Mining Theoretical Foundations and Applications

Recent advances in the computing and electronics technology particularly in sensor devices databases and distributed systems are leading to an exponential growth in the amount of data stored in databases It has been estimated that this amount doubles every 20 years For some applications this increase is even steeper Databases storing DNA sequence for example are doubling their size every 10 months This growth is occurring in several applications areas besides bioinformatics like financial transactions government data environmental monitoring satellite and medical images security data and web As large organizations recognize the high value of data stored in their databases and the importance of their data collection to support decision making there is a clear demand for sophisticated Data Mining tools Data mining tools play a key role in the extraction of useful knowledge from databases They can be used either to confirm a particular hypothesis or to automatically find patterns In the second case which is related to this book the goal may be either to describe the main patterns present in dataset what is known as descriptive Data Mining or to find patterns able to predict behaviour of specific attributes or features known as predictive Data Mining While the first goal is associated with tasks like clustering summarization and association the second is found in classification and regression problems

Computational Intelligence Systems in Industrial Engineering Cengiz Kahraman,2012-11-05 Industrial engineering is a branch of engineering dealing with the optimization of complex processes or systems It is concerned with the development improvement implementation and evaluation of production and service systems Computational Intelligence Systems find a wide application area in industrial engineering neural networks in forecasting fuzzy sets in capital budgeting ant colony optimization in scheduling Simulated Annealing in optimization etc This book will include most of the application areas of industrial engineering through these computational intelligence systems In the literature there is no book including many real and practical applications of Computational Intelligence Systems from the point of view of Industrial Engineering Every chapter will include explanatory and didactic applications It is aimed that the book will be a main source for MSc and PhD students

Foundations of Computational Intelligence Volume 3 Ajith Abraham,Aboul-Ella Hassanien,Patrick Siarry,Andries Engelbrecht,2009-05-01 Global optimization is a branch of applied mathematics and numerical analysis that deals with the task of finding the absolutely best set of admissible conditions to satisfy certain criteria objective functions formulated in mathematical terms Global optimization includes nonlinear stochastic and combinatorial programming multiobjective

programming control games geometry approximation algorithms for parallel architectures and so on Due to its wide usage and applications it has gained the attention of researchers and practitioners from a plethora of scientific domains Typical practical examples of global optimization applications include Traveling salesman problem and electrical circuit design minimize the path length safety engineering building and mechanical structures mathematical problems Kepler conjecture Protein structure prediction minimize the energy function etc Global Optimization algorithms may be categorized into several types Deterministic example branch and bound methods Stochastic optimization example simulated annealing Heuristics and meta heuristics example evolutionary algorithms etc Recently there has been a growing interest in combining global and local search strategies to solve more complicated optimization problems This edited volume comprises 17 chapters including several overview Chapters which provides an up to date and state of the art research covering the theory and algorithms of global optimization Besides research articles and expository papers on theory and algorithms of global optimization papers on numerical experiments and on real world applications were also encouraged The book is divided into 2 main parts

Applying Computational Intelligence Arthur Kordon, 2009-11-28 In theory there is no difference between theory and practice But in practice there is Jan L A van de Snepscheut The ow of academic ideas in the area of computational intelligence has penetrated industry with tremendous speed and persistence Thousands of applications have proved the practical potential of fuzzy logic neural networks evolutionary com tation swarm intelligence and intelligent agents even before their theoretical foundation is completely understood And the popularity is rising Some software vendors have pronounced the new machine learning gold rush to Transfer Data into Gold New buzzwords like data mining genetic algorithms and swarm optimization have enriched the top executives vocabulary to make them look more visionary for the 21st century The phrase fuzzy math became political jargon after being used by US President George W Bush in one of the election debates in the campaign in 2000 Even process operators are discussing the perf mance of neural networks with the same passion as the performance of the Dallas Cowboys However for most of the engineers and scientists introducing computational intelligence technologies into practice looking at the growing number of new approaches and understanding their theoretical principles and potential for value creation becomes a more and more dif cult task **Intelligent**

Systems'2014 P. Angelov, K.T. Atanassov, L. Doukovska, M. Hadjiski, V. Jotsov, J. Kacprzyk, N. Kasabov, S. Sotirov, E. Szmidi, S. Zadrozny, 2014-09-23 This two volume set of books constitutes the proceedings of the 2014 7th IEEE International Conference Intelligent Systems IS or IEEE IS 2014 for short held on September 24 26 2014 in Warsaw Poland Moreover it contains some selected papers from the collocated IWIFSGN 2014 Thirteenth International Workshop on Intuitionistic Fuzzy Sets and Generalized Nets The conference was organized by the Systems Research Institute Polish Academy of Sciences Department IV of Engineering Sciences Polish Academy of Sciences and Industrial Institute of Automation and Measurements PIAP The papers included in the two proceedings volumes have been subject to a thorough review process by

three highly qualified peer reviewers Comments and suggestions from them have considerably helped improve the quality of the papers but also the division of the volumes into parts and assignment of the papers to the best suited parts

Uncertainty and Imprecision in Decision Making and Decision Support - New Advances, Challenges, and Perspectives

Krassimir T. Atanassov, Vassia Atanassova, Janusz Kacprzyk, Andrzej Kałusko, Maciej Krawczak, Jan W. Owsinski, Sotir S. Sotirov, Evdokia Sotirova, Eulalia Szmidt, Sławomir Zadrozny, 2023-10-20 This volume is composed of selected papers from two conferences held in Warsaw Poland on October 13 15 2022 the BOS SOR 2022 National Conference on Operational and Systems Research one of premiere conferences in the field of operational and systems research and the Twentieth International Workshop on Intuitionistic Fuzzy Sets and Generalized Nets IWIFSGN 2022 one of premiere conferences on fuzzy logic notably on extensions of the traditional fuzzy sets also comprising a considerable part on the Generalized Nets GNs A joint publication of selected papers from the two conferences follows a long tradition of such a joint organization and from a substantial point of view combines systems modeling systems analysis broadly perceived operational research notably optimization decision making and decision support with various aspects of uncertain and imprecise information and their related tools and techniques

Intelligent Computing in Carcinogenic Disease Detection

Kaushik Das Sharma, Subhajit Kar, Madhubanti Maitra, 2024-05-16 This book draws on a range of intelligent computing methodologies to effectively detect and classify various carcinogenic diseases These methodologies which have been developed on a sound foundation of gene level cell level and tissue level carcinogenic datasets are discussed in Chapters 1 and 2 Chapters 3 4 and 5 elaborate on several intelligent gene selection methodologies such as filter methodologies and wrapper methodologies In addition various gene selection philosophies for identifying relevant carcinogenic genes are described in detail In turn Chapters 6 and 7 tackle the issues of using cell level and tissue level datasets to effectively detect carcinogenic diseases The performance of different intelligent feature selection techniques is evaluated on cell level and tissue level datasets to validate their effectiveness in the context of carcinogenic disease detection In closing the book presents illustrative case studies that demonstrate the value of intelligent computing strategies

Parallel Computing Technologies

Victor Malyshev, 2017-08-17 This book constitutes the proceedings of the 14th International Conference on Parallel Computing Technologies PaCT 2017 held in Nizhny Novgorod Russia in September 2017 The 25 full papers and 24 short papers presented were carefully reviewed and selected from 93 submissions The papers are organized in topical sections on mainstream parallel computing parallel models and algorithms in numerical computation cellular automata and discrete event systems organization of parallel computation parallel computing applications

Genetic and Evolutionary Computing

Jeng-Shyang Pan, Pavel Krömer, Václav Snášel, 2013-08-04 Genetic and Evolutionary Computing This volume of Advances in Intelligent Systems and Computing contains accepted papers presented at ICGEC 2013 the 7th International Conference on Genetic and Evolutionary Computing The conference this year was technically co sponsored by The Waseda University in

Japan Kaohsiung University of Applied Science in Taiwan and VSB Technical University of Ostrava ICGEC 2013 was held in Prague Czech Republic Prague is one of the most beautiful cities in the world whose magical atmosphere has been shaped over ten centuries Places of the greatest tourist interest are on the Royal Route running from the Powder Tower through Celetna Street to Old Town Square then across Charles Bridge through the Lesser Town up to the Hradcany Castle One should not miss the Jewish Town and the National Gallery with its fine collection of Czech Gothic art collection of old European art and a beautiful collection of French art The conference was intended as an international forum for the researchers and professionals in all areas of genetic and evolutionary computing The main topics of ICGEC 2013 included Intelligent Computing Evolutionary Computing Genetic Computing and Grid Computing Fusion of Hard and Soft Control Strategies for the Robotic Hand Cheng-Hung Chen, Desineni Subbaram Naidu, 2017-09-13 An in depth review of hybrid control techniques for smart prosthetic hand technology by two of the world's pioneering experts in the field Long considered the stuff of science fiction a prosthetic hand capable of fully replicating all of that appendage's various functions is closer to becoming reality than ever before This book provides a comprehensive report on exciting recent developments in hybrid control techniques one of the most crucial hurdles to be overcome in creating smart prosthetic hands Coauthored by two of the world's foremost pioneering experts in the field Fusion of Hard and Soft Control Strategies for Robotic Hand treats robotic hands for multiple applications It begins with an overview of advances in main control techniques that have been made over the past decade before addressing the military context for affordable robotic hand technology with tactile and or proprioceptive feedback for hand amputees Kinematics homogeneous transformations inverse and differential kinematics trajectory planning and dynamic models of two link thumb and three link index finger are discussed in detail The remainder of the book is devoted to the most promising soft computing techniques particle swarm optimization techniques and strategies combining hard and soft controls In addition the book includes a report on exciting new developments in prosthetic robotic hand technology with an emphasis on the fusion of hard and soft control strategies Covers both prosthetic and non prosthetic hand designs for everything from routine human operations robotic surgery and repair and maintenance to hazardous materials handling space applications explosives disposal and more Provides a comprehensive overview of five fingered robotic hand technology kinematics dynamics and control Features detailed coverage of important recent developments in neuroprosthetics Fusion of Hard and Soft Control Strategies for Robotic Hand is a must read for researchers in control engineering robotic engineering biomedical sciences and engineering and rehabilitation engineering

Computational Intelligence: A Compendium John Fulcher, L. C. Jain, 2008-06-16 Computational Intelligence A Compendium presents a well structured overview about this rapidly growing field with contributions of leading experts in Computational Intelligence The main focus of the compendium is on applied methods tried and proven effective to realworld problems which is especially useful for practitioners researchers students and also newcomers to the field The 25 chapters

are grouped into the following themes I Overview and Background II Data Preprocessing and Systems Integration III Artificial Intelligence IV Logic and Reasoning V Ontology VI Agents VII Fuzzy Systems VIII Artificial Neural Networks IX Evolutionary Approaches X DNA and Immune based Computing

Design of Intelligent Systems Based on Fuzzy Logic, Neural Networks and Nature-Inspired Optimization Patricia Melin, Oscar Castillo, Janusz Kacprzyk, 2015-06-12 This book presents recent advances on the design of intelligent systems based on fuzzy logic neural networks and nature inspired optimization and their application in areas such as intelligent control and robotics pattern recognition time series prediction and optimization of complex problems The book is organized in eight main parts which contain a group of papers around a similar subject The first part consists of papers with the main theme of theoretical aspects of fuzzy logic which basically consists of papers that propose new concepts and algorithms based on fuzzy systems The second part contains papers with the main theme of neural networks theory which are basically papers dealing with new concepts and algorithms in neural networks The third part contains papers describing applications of neural networks in diverse areas such as time series prediction and pattern recognition The fourth part contains papers describing new nature inspired optimization algorithms The fifth part presents diverse applications of nature inspired optimization algorithms The sixth part contains papers describing new optimization algorithms The seventh part contains papers describing applications of fuzzy logic in diverse areas such as time series prediction and pattern recognition Finally the eighth part contains papers that present enhancements to meta heuristics based on fuzzy logic techniques

Intelligent Data Engineering and Automated Learning – IDEAL 2019 Hujun Yin, David Camacho, Peter Tino, Antonio J. Tallón-Ballesteros, Ronaldo Menezes, Richard Allmendinger, 2019-11-07 This two volume set of LNCS 11871 and 11872 constitutes the thoroughly refereed conference proceedings of the 20th International Conference on Intelligent Data Engineering and Automated Learning IDEAL 2019 held in Manchester UK in November 2019 The 94 full papers presented were carefully reviewed and selected from 149 submissions These papers provided a timely sample of the latest advances in data engineering and machine learning from methodologies frameworks and algorithms to applications The core themes of IDEAL 2019 include big data challenges machine learning data mining information retrieval and management bio neuro informatics bio inspired models including neural networks evolutionary computation and swarm intelligence agents and hybrid intelligent systems real world applications of intelligent techniques and AI

Biotechnology: Concepts, Methodologies, Tools, and Applications Management Association, Information Resources, 2019-06-07 Biotechnology can be defined as the manipulation of biological process systems and organisms in the production of various products With applications in a number of fields such as biomedical chemical mechanical and civil engineering research on the development of biologically inspired materials is essential to further advancement Biotechnology Concepts Methodologies Tools and Applications is a vital reference source for the latest research findings on the application of biotechnology in medicine engineering agriculture food production and

other areas It also examines the economic impacts of biotechnology use Highlighting a range of topics such as pharmacogenomics biomedical engineering and bioinformatics this multi volume book is ideally designed for engineers pharmacists medical professionals practitioners academicians and researchers interested in the applications of biotechnology

Big Data Analytics using Computational Intelligence Approaches Akram Pasha, Syed Ziaur Rahman, 2024-11-21 This book offers an in depth analysis of Big Data Analytics merging the fundamentals of data handling with state of the art computational intelligence methodologies It presents a comprehensive overview of key principles including data storage visualization and algorithmic strategies as well

Intelligent Control Kaushik Das Sharma, Amitava Chatterjee, Anjan Rakshit, 2018-08-28 This book discusses systematic designs of stable adaptive fuzzy logic controllers employing hybridizations of Lyapunov strategy based approaches H theory based approaches and contemporary stochastic optimization techniques The text demonstrates how candidate stochastic optimization techniques like Particle swarm optimization PSO harmony search HS algorithms covariance matrix adaptation CMA etc can be utilized in conjunction with the Lyapunov theory H theory to develop such hybrid control strategies The goal of developing a series of such hybridization processes is to combine the strengths of both Lyapunov theory H theory based local search methods and stochastic optimization based global search methods so as to attain superior control algorithms that can simultaneously achieve desired asymptotic performance and provide improved transient responses The book also demonstrates how these intelligent adaptive control algorithms can be effectively utilized in real life applications such as in temperature control for air heater systems with transportation delay vision based navigation of mobile robots intelligent control of robot manipulators etc

Proceedings of the 16th International Conference on Hybrid Intelligent Systems (HIS 2016) Ajith Abraham, Abdelkrim Haqiq, Adel M. Alimi, Ghita Mezzour, Nizar Rokbani, Azah Kamilah Muda, 2017-02-21 This book presents the latest research in hybrid intelligent systems It includes 57 carefully selected papers from the 16th International Conference on Hybrid Intelligent Systems HIS 2016 and the 8th World Congress on Nature and Biologically Inspired Computing NaBIC 2016 held on November 21 23 2016 in Marrakech Morocco HIS NaBIC 2016 was jointly organized by the Machine Intelligence Research Labs MIR Labs USA Hassan 1st University Settat Morocco and University of Sfax Tunisia Hybridization of intelligent systems is a promising research field in modern artificial computational intelligence and is concerned with the development of the next generation of intelligent systems The conference s main aim is to inspire further exploration of the intriguing potential of hybrid intelligent systems and bio inspired computing As such the book is a valuable resource for practicing engineers scientists and researchers working in the field of computational intelligence and artificial intelligence

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Fundamentals Of Computational Swarm Intelligence Introduction

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