

Towards Hybrid And Adaptive Computing A Perspective Studies In Computational Intelligence

Towards Hybrid and Adaptive Computing

Soft Computing today is a very vast field whose extent is beyond measure. This book offers a well structured presentation of the basic concepts of Artificial Neural Networks, Fuzzy Inference Systems and Evolutionary Algorithms.

Hybrid Computational Intelligence

Hybrid Computational Intelligence: Challenges and Utilities is a comprehensive resource that begins with the basics and main components of computational intelligence. It brings together many different aspects of the current research on HCI technologies, such as neural networks, support vector machines, fuzzy logic and evolutionary computation, while also covering a wide range of applications and implementation issues, from pattern recognition and system modeling, to intelligent control problems and biomedical applications. The book also explores the most widely used applications of hybrid computation as well as the history of their development. Each individual methodology provides hybrid systems with complementary reasoning and searching methods which allow the use of domain knowledge and empirical data to solve complex problems. Provides insights into the latest research trends in hybrid intelligent algorithms and architectures Focuses on the application of hybrid intelligent techniques for pattern mining and recognition, in big data analytics, and in human-computer interaction Features hybrid intelligent applications in biomedical engineering and healthcare informatics

Advances in Intelligent and Distributed Computing

This book presents the proceedings of the 1st International Symposium on Intelligent and Distributed Computing, IDC 2007, held in Craiova, Romania, October 2007. Coverage includes: autonomous and adaptive computing; data mining and knowledge discovery; distributed problem solving and decision making; e-business, e-health and e-learning; genetic algorithms; image processing; information retrieval; intelligence in mobile and ubiquitous computing.

Recent Advances on Hybrid Approaches for Designing Intelligent Systems

This book describes recent advances on hybrid intelligent systems using soft computing techniques for diverse areas of application, such as intelligent control and robotics, pattern recognition, time series prediction and optimization complex problems. Soft Computing (SC) consists of several intelligent computing paradigms, including fuzzy logic, neural networks and bio-inspired optimization algorithms, which can be used to produce powerful hybrid intelligent systems. The book is organized in five main parts, which contain a group of papers around a similar subject. The first part consists of papers with the main theme of type-2 fuzzy logic, which basically consists of papers that propose new models and applications for type-2 fuzzy systems. The second part contains papers with the main theme of bio-inspired optimization algorithms, which are basically papers using nature-inspired techniques to achieve optimization of complex optimization problems in diverse areas of application. The third part contains papers that deal with new models and applications of neural networks in real world problems. The fourth part contains papers with the theme of intelligent optimization methods, which basically consider the proposal of new methods of optimization to solve complex real world optimization problems. The fifth part contains papers with the theme of evolutionary methods and intelligent computing, which are papers considering soft computing methods for applications related to diverse areas, such as natural language processing, recommending systems and optimization.

New Frontiers in Computational Intelligence and Its Applications

Computational Intelligence is a broad and active research area that is growing rapidly due to the many successful applications of these new techniques in very diverse problems. Many industries have benefited from adopting this technology. The increased number of patents and diverse range of products developed using computational intelligence methods is evidence of this fact. The goal of this book is to provide highlights of the current research in computational intelligence area. The book consists of research papers in the fields of neural networks, fuzzy logic, evolutionary computing, hybrid evolutionary computing-fuzzy logic systems, hybrid neural networks-evolutionary computing and fuzzy logic systems, image processing and vision, advances in robotics, control and manufacturing, and rough sets.

Intelligent Control

Intelligent Control considers non-traditional modelling and control approaches to nonlinear systems. Fuzzy logic, neural networks and evolutionary computing techniques are the main tools used. The book presents a modular switching fuzzy logic controller where a PD-type fuzzy controller is executed first followed by a PI-type fuzzy controller thus improving the performance of the controller compared with a PID-type fuzzy controller. The advantage of the switching-type fuzzy controller is that it uses one rule-base thus minimises the rule-base during execution. A single rule-base is developed by merging the membership functions for change of error of the PD-type controller and sum of error of the PI-type controller. Membership functions are then optimized using evolutionary algorithms. Since the two fuzzy controllers were executed in series, necessary further tuning of the differential and integral scaling factors of the controller is then performed. Neural-network-based tuning for the scaling parameters of the fuzzy controller is then described and finally an evolutionary algorithm is applied to the neurally-tuned-fuzzy controller in which the sigmoidal function shape of the neural network is determined. The important issue of stability is addressed and the text demonstrates empirically that the developed controller was stable within the operating range. The text concludes with ideas for future research to show the reader the potential for further study in this area. Intelligent Control will be of interest to researchers from engineering and computer science backgrounds working in the intelligent and adaptive control.

Do Smart Adaptive Systems Exist?

Do Smart Adaptive Systems Exist? is intended as a reference and a guide summarising and focusing on best practices when using intelligent techniques and building systems requiring a degree of adaptation and intelligence. It is therefore not intended as a collection of the most recent research results, but as a practical guide for experts from other areas and industrial users interested in building solutions to their problems using intelligent techniques. One of the main issues covered is an attempt to answer the question of how to select and/or combine suitable intelligent techniques from a large pool of potential solutions. Another attractive feature of the book is that it brings together experts from neural network, fuzzy, machine learning, evolutionary and hybrid systems communities who will provide their views on how these different intelligent technologies have contributed and will contribute to creation of smart adaptive systems of the future.

Handbook On Computational Intelligence (In 2 Volumes)

With the Internet, the proliferation of Big Data, and autonomous systems, mankind has entered into an era of 'digital obesity'. In this century, computational intelligence, such as thinking machines, have been brought forth to process complex human problems in a wide scope of areas — from social sciences, economics and biology, medicine and social networks, to cyber security. The Handbook of Computational Intelligence (in two volumes) prompts readers to look at these problems from a non-traditional angle. It takes a step by step approach, supported by case studies, to explore the issues that have arisen in the process. The Handbook covers many classic paradigms, as well as recent achievements and future promising developments to solve some of these very complex problems. Volume one explores the subjects of fuzzy logic and systems, artificial neural networks, and learning systems. Volume two delves into evolutionary computation, hybrid systems, as well as the applications of computational intelligence in decision making, the process industry, robotics, and autonomous systems. This work is a 'one-stop-shop' for beginners, as well as an inspirational source for more advanced researchers. It is a useful resource for lecturers and learners alike.

Advances in Evolutionary Computing for System Design

Evolutionary computing paradigms offer robust and powerful adaptive search mechanisms for system design. This book's thirteen chapters cover a wide area of topics in evolutionary computing and applications, including an introduction to evolutionary computing in system design; evolutionary neuro-fuzzy systems; and evolution of fuzzy controllers. The book will be useful to researchers in intelligent systems with interest in evolutionary computing, as well as application engineers and system designers.

Tree-Structure based Hybrid Computational Intelligence

Research in computational intelligence is directed toward building thinking machines and improving our understanding of intelligence. As evident, the ultimate achievement in this field would be to mimic or exceed human cognitive capabilities including reasoning, recognition, creativity, emotions, understanding, learning and so on. In this book, the authors illustrate an hybrid computational intelligence framework and its applications for various problem solving tasks. Based on tree-structure based encoding and the specific function operators, the models can be flexibly constructed and evolved by using simple computational intelligence techniques. The main idea behind this model is the flexible neural tree, which is very adaptive, accurate and efficient. Based on the pre-defined instruction/operator sets, a flexible neural tree model can be created and evolved. This volume comprises of 6 chapters including an introductory chapter giving the fundamental definitions and the last Chapter provides some important research challenges. Academics, scientists as well as engineers engaged in research, development and application of computational intelligence techniques and data mining will find the comprehensive coverage of this

book invaluable.

Computer and Information Science 2012

The series \"Studies in Computational Intelligence\" (SCI) publishes new developments and advances in the various areas of computational intelligence – quickly and with a high quality. The intent is to cover the theory, applications, and design methods of computational intelligence, as embedded in the fields of engineering, computer science, physics and life science, as well as the methodologies behind them. The series contains monographs, lecture notes and edited volumes in computational intelligence spanning the areas of neural networks, connectionist systems, genetic algorithms, evolutionary computation, artificial intelligence, cellular automata, self-organizing systems, soft computing, fuzzy systems, and hybrid intelligent systems. Critical to both contributors and readers are the short publication time and world-wide distribution - this permits a rapid and broad dissemination of research results. The purpose of the 11th IEEE/ACIS International Conference on Computer and Information Science (ICIS 2012) was held on May 30-1June1, 2012 in Shanghai, China is to bring together scientist, engineers, computer users, students to share their experiences and exchange new ideas, and research results about all aspects (theory, applications and tools) of computer and information science, and to discuss the practical challenges encountered along the way and the solutions adopted to solve them The conference organizers selected the best 20 papers from those papers accepted for presentation at the conference in order to publish them in this volume. The papers were chosen based on review scores submitted by members of the program committee, and underwent further rigorous rounds of review.

Soft Computing for Intelligent Control and Mobile Robotics

This book describes in a detailed fashion the application of hybrid intelligent systems using soft computing techniques for intelligent control and mobile robotics. Soft Computing (SC) consists of several intelligent computing paradigms, including fuzzy logic, neural networks, and bio-inspired optimization algorithms, which can be used to produce powerful hybrid intelligent systems. The prudent combination of SC techniques can produce powerful hybrid intelligent systems that are capable of solving real-world problems. This is illustrated in this book with a wide range of applications, with particular emphasis in intelligent control and mobile robotics. The book is organized in five main parts, which contain a group of papers around a similar subject. The first part consists of papers with the main theme of theory and algorithms, which are basically papers that propose new models and concepts, which can be the basis for achieving intelligent control and mobile robotics. The second part contains papers with the main theme of intelligent control, which are basically papers using bio-inspired techniques, like evolutionary algorithms and neural networks, for achieving intelligent control of non-linear plants. The third part contains papers with the theme of optimization of fuzzy controllers, which basically consider the application of bio-inspired optimization methods to automate the de-sign process of optimal type-1 and type-2 fuzzy controllers. The fourth part contains papers that deal with the application of SC techniques in times series prediction and intelligent agents. The fifth part contains papers with the theme of computer vision and robotics, which are papers considering soft computing methods for applications related to vision and robotics.

Bio-Inspired Technologies for the Hardware of Adaptive Systems

Evolvable Hardware (EHW) has emerged as a sub-domain of artificial evolution represented by a design methodology (consortium of methods) involving the application of Evolutionary Algorithms (EA) to the synthesis of digital and analogue electronic circuits and systems. Nevertheless, the most benefit for the society and indeed most revolutionizing application of EA is its hardware implementation leading to the EHW. These new EA based methodologies led to a new type of machines that is evolved to attain a desired behaviour, which means they have a behavioural computational intelligence. EHW is a special case of the adaptive hardware, namely being strongly related to the Adaptive Systems (AS) and the Adaptive Hardware (AH). The book presents a careful selection of the field that very well reflects the breadth of this high technology and its terminology and applications in context of the AS/AH. The harmonious symbiosis of the engineering approach and the accurate scientific methodology features the aspects of highly relevant and practical design principles governing the development of EHW and its connections with AS/AH. This book is both attractive and useful for everybody interested in the design and analysis of EHW in context of AS/AH and implementation of real time adaptive hardware hybrid intelligent systems.

Handbook of Research on Artificial Intelligence Techniques and Algorithms

For decades, optimization methods such as Fuzzy Logic, Artificial Neural Networks, Firefly, Simulated annealing, and Tabu search, have been capable of handling and tackling a wide range of real-world application problems in society and nature. Analysts have turned to these problem-solving techniques in the event during natural disasters and chaotic systems research. The Handbook of Research on Artificial Intelligence Techniques and Algorithms highlights the cutting edge developments in this promising research area. This premier reference work applies Meta-heuristics Optimization (MO) Techniques to real world problems in a variety of fields including business, logistics, computer science, engineering, and government. This work is particularly relevant to researchers, scientists, decision-makers, managers, and practitioners.

Hybrid Computational Intelligence

Hybrid computational intelligent techniques are efficient in dealing with the real-world problems encountered in engineering fields. The primary objective of this book is to provide an exhaustive introduction as well as review of the hybrid computational intelligent paradigm, with supportive case studies. In addition, it aims to provide a gallery of engineering applications where this computing paradigm can be effectively use. Finally, it focuses on the recent quantum inspired hybrid intelligence to develop intelligent solutions for the future. The book also incorporates video demonstrations of each application for better understanding of the subject matter.

Computational Intelligence

Computational Intelligence: An Introduction, Second Edition offers an in-depth exploration into the adaptive mechanisms that enable intelligent behaviour in complex and changing environments. The main focus of this text is centred on the computational modelling of biological and natural intelligent systems, encompassing swarm intelligence, fuzzy systems, artificial neural networks, artificial immune systems and evolutionary computation. Engelbrecht provides readers with a wide knowledge of Computational Intelligence (CI) paradigms and algorithms; inviting readers to implement and problem solve real-world, complex problems within the CI development framework. This implementation framework will enable readers to tackle new problems without any difficulty through a single Java class as part of the CI library. Key features of this second edition include: A tutorial, hands-on based presentation of the material. State-of-the-art coverage of the most recent developments in computational intelligence with more elaborate discussions on intelligence and artificial intelligence (AI). New discussion of Darwinian evolution versus Lamarckian evolution, also including swarm robotics, hybrid systems and artificial immune systems. A section on how to perform empirical studies; topics including statistical analysis of stochastic algorithms, and an open source library of CI algorithms. Tables, illustrations, graphs, examples, assignments, Java code implementing the algorithms, and a complete CI implementation and experimental framework. Computational Intelligence: An Introduction, Second Edition is essential reading for third and fourth year undergraduate and postgraduate students studying CI. The first edition has been prescribed by a number of overseas universities and is thus a valuable teaching tool. In addition, it will also be a useful resource for researchers in Computational Intelligence and Artificial Intelligence, as well as engineers, statisticians, operational researchers, and bioinformaticians with an interest in applying AI or CI to solve problems in their domains. Check out <http://www.ci.cs.up.ac.za> for examples, assignments and Java code implementing the algorithms.

Advanced Intelligent Computing Theories and Applications

The International Conference on Intelligent Computing (ICIC) was formed to provide an annual forum dedicated to the emerging and challenging topics in artificial intelligence, machine learning, bioinformatics, and computational biology, etc. It aims to bring together researchers and practitioners from both academia and industry to share ideas, problems and solutions related to the multifaceted aspects of intelligent computing. ICIC 2008, held in Shanghai, China, September 15–18, 2008, constituted the 4th International Conference on Intelligent Computing. It built upon the success of ICIC 2007, ICIC 2006 and ICIC 2005 held in Qingdao, Kunming and Hefei, China, 2007, 2006 and 2005, respectively. This year, the conference concentrated mainly on the theories and methodologies as well as the emerging applications of intelligent computing. Its aim was to unify the picture of contemporary intelligent computing techniques as an integral concept that highlights the trends in advanced computational intelligence and bridges theoretical research with applications. Therefore, the theme for this conference was “Emerging Intelligent Computing Technology and Applications”. Papers focusing on this theme were solicited, addressing theories, methodologies, and applications in science and technology.

Growing Adaptive Machines

The pursuit of artificial intelligence has been a highly active domain of research for decades, yielding exciting scientific insights and productive new technologies. In terms of generating intelligence, however, this pursuit has yielded only limited success. This book explores the hypothesis that adaptive growth is a means of moving forward. By emulating the biological process of development, we can incorporate desirable characteristics of natural neural systems into engineered designs and thus move closer towards the creation of brain-like systems. The particular focus is on how to design artificial neural networks for engineering tasks. The book consists of contributions from 18 researchers, ranging from detailed reviews of recent domains by senior scientists, to exciting new contributions representing the state of the art in machine learning research. The book begins with broad overviews of artificial neurogenesis and bio-inspired machine learning, suitable both as an introduction to the domains and as a reference for experts. Several contributions provide perspectives and future hypotheses on recent highly successful trains of research, including deep learning, the Hyper NEAT model of developmental neural network design, and a simulation of the visual cortex. Other contributions cover recent advances in the design of bio-inspired artificial neural networks, including the creation of machines for classification, the behavioural control of virtual agents, the design of virtual multi-component robots and morphologies and the creation of flexible intelligence. Throughout, the contributors share their vast expertise on the means and benefits of creating brain-like machines. This book is appropriate for advanced students and practitioners of artificial intelligence and machine learning.

Handbook of Research on Soft Computing and Nature-Inspired Algorithms

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.

Advances in Computational Intelligence

Computational Intelligence (CI) is a recently emerging area in fundamental and applied research, exploiting a number of advanced information processing technologies that mainly embody neural networks, fuzzy logic and evolutionary computation. With a major concern to exploiting the tolerance for imperfection, uncertainty, and partial truth to achieve tractability, robustness and low solution cost, it becomes evident that composing methods of CI should be working concurrently rather than separately. It is this conviction that research on the synergism of CI paradigms has experienced significant growth in the last decade with some areas nearing maturity while many others remaining unresolved. This book systematically summarizes the latest findings and sheds light on the respective fields that might lead to future breakthroughs. Contents: A Quest for Granular Computing and Logic Processing (W Pedrycz); Abstraction and Linguistic Analysis of Conventional Numerical Dynamic Systems (F-Y Wang); Slicing: A Distributed Learning Approach (S A Eschrich & L O Hall); Marginal Learning Algorithms in Statistical Machine Learning (Q Tao & J Wang); Constraint Handling in Genetic Algorithm for Optimization (G G Yen); Hybrid PSO-EA Algorithm for Training Feedforward and Recurrent Neural Networks for Challenging Problems (X Cai et al.); Modular Wavelet-Fuzzy Networks (Y Lin & F-Y Wang); Ant Colony Algorithms: The State-of-the-Art (J Zhang et al.); Motif Discoveries in DNA and Protein Sequences Using Self-Organizing Neural Networks (D Liu & X Xiong); Computational Complexities of Combinatorial Problems with Applications to Reverse Engineering of Biological Networks (P Berman et al.); Advances in Fingerprint Recognition Algorithms with Application (J Tian et al.); Adaptation and Predictive Control Observed in Neuromuscular Control Systems (J He); Robust Adaptive Approximation Based Backstepping via Localized Adaptive Bounding (Y Zhao & J A Farrell); Dynamically Connected Fuzzy Single Input Rule Modules and Application to Underactuated Systems (J Yi et al.). Readership: Researchers, graduate and senior level undergraduate students in electrical & electronic engineering, computer engineering, neural networks, fuzzy logic and artificial intelligence.

Innovations in Hybrid Intelligent Systems

This carefully edited book combines symbolic and sub-symbolic techniques to construct more robust and reliable problem solving models. This volume focused on "Hybrid Artificial Intelligence Systems" contains a collection of papers that were presented at the 2nd International Workshop on Hybrid Artificial Intelligence Systems, held in 12 - 13 November, 2007, Salamanca, Spain.

Computational Intelligence

Computational Intelligence: Concepts to Implementations provides the most complete and practical coverage of computational intelligence tools and techniques to date. This book integrates various natural and engineering disciplines to establish Computational Intelligence. This is the first comprehensive textbook on the subject, supported with lots of practical examples. It asserts that computational intelligence rests on a foundation of evolutionary computation. This refreshing view has set the book apart from other books on computational intelligence. This book lays emphasis on practical applications and computational tools, which are very useful and important for further development of the computational intelligence field. Focusing on evolutionary computation, neural networks, and fuzzy logic, the authors have constructed an approach to thinking about and working with computational intelligence that has, in their extensive experience, proved highly effective. The book moves clearly and efficiently from concepts and paradigms to algorithms and implementation techniques by focusing, in the early chapters, on the specific con. It explores a number of key themes, including self-organization, complex adaptive systems, and emergent computation. It details the metrics and analytical tools needed to assess the performance of computational intelligence tools. The book concludes with a series of case studies that illustrate a wide range of successful applications. This book will appeal to professional and academic researchers in computational intelligence applications, tool development, and systems. Moves clearly and efficiently from concepts and paradigms to algorithms and implementation techniques by focusing, in the early chapters, on the specific concepts and paradigms that inform the authors' methodologies Explores a number of key themes, including self-organization, complex adaptive systems, and emergent computation Details the metrics and analytical tools needed to assess the performance of computational intelligence tools Concludes with a series of case studies that illustrate a wide range of successful applications Presents code examples in C and C++ Provides, at the end of each chapter, review questions and exercises suitable for graduate students, as well as researchers and practitioners engaged in self-study

Intelligent Systems: From Theory to Practice

In the modern science and technology there are some research directions and challenges which are at the forefront of world wide research activities because of their relevance. This relevance may be related to different aspects. First, from a point of view of researchers it can be implied by just an analytic or algorithmic difficulty in the solution of problems within an area. From a broader perspective, this relevance can be related to how important problems and challenges in a particular area are to society, corporate or national competitiveness, etc. Needless to say that the latter, more global challenges are probably more decisive a driving force for science seen from a global perspective. One of such “meta-challenges” in the present world is that of intelligent systems. For a long time it has been obvious that the complexity of our world and the speed of changes we face in virtually all processes that have impact on our life imply a need to automate many tasks and processes that have been so far limited to human beings because they require some sort of intelligence.

Hybrid Information Systems

Hybrid intelligent systems are becoming a very important problem-solving methodology affecting researchers and practitioners in areas ranging from science and technology to business and commerce. This volume focuses on the hybridization of different soft computing technologies and their interactions with hard computing techniques, other intelligent computing frameworks, and agents. Topics covered include: genetic-neurocomputing, neuro-fuzzy systems, genetic-fuzzy systems, genetic-fuzzy neurocomputing, hybrid optimization techniques, interaction with intelligent agents, fusion of soft computing and hard computing techniques, other intelligent systems and hybrid systems applications. The different contributions were presented at the first international workshop on hybrid intelligent systems (HIS1) in Adelaide, Australia.

Innovations in Intelligent Systems

Innovations in Intelligent Systems is a rare collection of the latest developments in intelligent paradigms such as knowledge-based systems, computational intelligence and hybrid combinations as well as practical applications in engineering, science, business and commerce. The book covers central topics such as intelligent multi-agent systems, data mining, case-based reasoning, and rough sets. Essential techniques to the development of intelligent machines are investigated such as pattern recognition and classification, machine learning, natural language processing, grammar, evolutionary schemes, fuzzy-neural procedures, and intelligent vision. The book also includes useful applications ranging from medical diagnosis and technical/medical language translation, to power demand forecasting and manufacturing plants. Due to its depth and breadth of the coverage and the usefulness of the techniques and applications, this book is a valuable reference for experts and students alike.

Computational Intelligence

This book is about synergy in computational intelligence (CI). It is a collection of chapters that covers a rich and diverse variety of computer-based techniques, all involving some aspect of computational intelligence, but each one taking a somewhat pragmatic view. Many complex problems in the real world require the application of some form of what we loosely call “intelligence” for their solution. Few can be solved by the naive application of a single technique, however good it is. Authors in this collection recognize the limitations of individual paradigms, and propose some practical and novel ways in which different CI techniques can be combined with each other, or with more traditional computational techniques, to produce powerful problem-solving environments which exhibit synergy, i. e. , systems in which the whole is greater than the sum of the parts . Computational intelligence is a relatively new term, and there is some disagreement as to its precise definition. Some practitioners limit its scope to schemes involving evolutionary algorithms, neural networks, fuzzy logic, or hybrids of these. For others, the definition is a little more flexible, and will include paradigms such as Bayesian belief networks, multi-agent systems, case-based reasoning and so on. Generally, the term has a similar meaning to the well-known phrase “Artificial Intelligence” (AI), although CI is perceived more as a “bottom up” approach from which intelligent behaviour can emerge, whereas AI tends to be studied from the “top down”, and derive from pondering upon the “meaning of intelligence”. (These and other key issues will be discussed in more detail in Chapter 1.

Soft Computing for Recognition Based on Biometrics

This book describes bio-inspired models and applications of hybrid intelligent systems using soft computing techniques for image analysis and pattern recognition based on biometrics and other sources. Each section groups papers on a similar subject.

Soft Computing and Intelligent Systems

The field of soft computing is emerging from the cutting edge research over the last ten years devoted to fuzzy engineering and genetic algorithms. The subject is being called soft computing and computational intelligence. With

acceptance of the research fundamentals in these important areas, the field is expanding into direct applications through engineering and systems science. This book cover the fundamentals of this emerging filed, as well as direct applications and case studies. There is a need for practicing engineers, computer scientists, and system scientists to directly apply \"fuzzy\" engineering into a wide array of devices and systems.

Evolutionary Computation: Theory and Applications

Evolutionary computation is the study of computational systems which use ideas and get inspiration from natural evolution and adaptation. This book is devoted to the theory and application of evolutionary computation. It is a self-contained volume which covers both introductory material and selected advanced topics. The book can roughly be divided into two major parts: the introductory one and the one on selected advanced topics. Each part consists of several chapters which present an in-depth discussion of selected topics. A strong connection is established between evolutionary algorithms and traditional search algorithms. This connection enables us to incorporate ideas in more established fields into evolutionary algorithms. The book is aimed at a wide range of readers. It does not require previous exposure to the field since introductory material is included. It will be of interest to anyone who is interested in adaptive optimization and learning. People in computer science, artificial intelligence, operations research, and various engineering fields will find it particularly interesting. Contents: Introduction (X Yao) Evolutionary Computation in Behavior Engineering (M Colombetti & M Dorigo) A General Method for Incremental Self-Improvement and Multi-Agent Learning (J Schmidhuber) Teacher: A Genetics-Based System for Learning and for Generalizing Heuristics (B W Wah & A Ieumwananonthachai) Automatic Discovery of Protein Motifs Using Genetic Programming (J R Koza & D Andre) The Role of Self Organization in Evolutionary Computations (A C Tsoi & J Shaw) Virus-Evolutionary Genetic Algorithm and Its Application to Traveling Salesman Problem (T Fukuda et al.) Hybrid Evolutionary Optimization Algorithm for Constrained Problems (J-H Kim & H Myung) CAM-BRAIN — The Evolutionary Engineering of a Billion Neuron Artificial Brain (H de Garis) An Evolutionary Approach to the N-Player Iterated Prisoner's Dilemma Game (X Yao & Darwen) Readership: Graduate students, practitioners and researchers in engineering and electronics and computer science. keywords: Genetic Algorithms; Evolutionary Computation; Evolutionary Algorithms; Genetic Programming; Evolutionary Robotics; Global Optimization; Evolutionary Games; Global Optimization; Machine Learning; Artificial Intelligence

Intelligent Distributed Computing VIII

This book represents the combined peer-reviewed proceedings of the Eight International Symposium on Intelligent Distributed Computing - IDC'2014, of the Workshop on Cyber Security and Resilience of Large-Scale Systems - WSRL-2014, and of the Sixth International Workshop on Multi-Agent Systems Technology and Semantics-MASTS-2014. All the events were held in Madrid, Spain, during September 3-5, 2014. The 47 contributions published in this book address several topics related to theory and applications of the intelligent distributed computing and multi-agent systems, including: agent-based data processing, ambient intelligence, collaborative systems, cryptography and security, distributed algorithms, grid and cloud computing, information extraction, knowledge management, big data and ontologies, social networks, swarm intelligence or videogames amongst others.

Artificial Immune Systems: A New Computational Intelligence Approach

Artificial Immune Systems (AIS) are adaptive systems inspired by the biological immune system and applied to problem solving. This book provides an accessible introduction that will be suitable for anyone who is beginning to study or work in this area. It gives a clear definition of an AIS, sets out the foundations of the topic (including basic algorithms), and analyses how the immune system relates to other biological systems and processes. No prior knowledge of immunology is needed - all the essential background information is covered in the introductory chapters. Key features of the book include: - A discussion of AIS in the context of Computational Intelligence; - Case studies in Autonomous Navigation, Computer Network Security, Job-Shop Scheduling and Data Analysis =B7 An extensive survey of applications; - A framework to help the reader design and understand AIS; - A web site with additional resources including pseudocodes for immune algorithms, and links to related sites. Written primarily for final year undergraduate and postgraduate students studying Artificial Intelligence, Evolutionary and Biologically Inspired Computing, this book will also be of interest to industrial and academic researchers working in related areas.

The State of the Art in Computational Intelligence

Computational Intelligence is a very dynamic domain of modern information society which integrates fields such as neural networks, fuzzy systems, evolutionary computation and intelligent systems in general. The book presents papers from the Euro-International Symposium on Computational Intelligence held in Kosice (Slovak Republic) in August 2000. It contains theoretical studies along with a chapter on applications and case studies. One of the main results of the symposium is that the combination of various techniques into hybrid intelligent systems will be very important for the development of intelligent information systems in the 21st century. The book also contains interesting forewords written by L.A. Zadeh, D.E. Goldberg, and K. Fukushima.

Hybrid Intelligent Systems

This volume offers a general view of recent conceptual developments of Soft Computing (SC). It presents successful new applications of SC to real-world problems leading to better performance than \"traditional\" methods. The edited volume covers a wide spectrum of applications including areas such as: robotic dynamic systems, non-linear plants, manufacturing systems, and time series prediction.

Hybrid Information Systems

Hybrid intelligent systems are becoming a very important problem-solving methodology affecting researchers and practitioners in areas ranging from science and technology to business and commerce. This volume focuses on the hybridization of different soft computing technologies and their interactions with hard computing techniques, other intelligent computing frameworks, and agents. Topics covered include: genetic-neurocomputing, neuro-fuzzy systems, genetic-fuzzy systems, genetic-fuzzy neurocomputing, hybrid optimization techniques, interaction with intelligent agents, fusion of soft computing and hard computing techniques, other intelligent systems and hybrid systems applications. The different contributions were presented at the first international workshop on hybrid intelligent systems (HIS1) in Adelaide, Australia.

Handbook of Research on Fireworks Algorithms and Swarm Intelligence

In recent years, swarm intelligence has become a popular computational approach among researchers working on optimization problems throughout the globe. Several algorithms inside swarm intelligence have been implemented due to their application to real-world issues and other advantages. A specific procedure, Fireworks Algorithm, is an emerging method that studies the explosion process of fireworks within local areas. Applications of this developing program are undiscovered, and research is necessary for scientists to fully understand the workings of this innovative system. The Handbook of Research on Fireworks Algorithms and Swarm Intelligence is a pivotal reference source that provides vital research on theory analysis, improvements, and applications of fireworks algorithm. While highlighting topics such as convergence rate, parameter applications, and global optimization analysis, this publication explores up-to-date progress on the specific techniques of this algorithm. This book is ideally designed for researchers, data scientists, mathematicians, engineers, software developers, postgraduates, and academicians seeking coverage on this evolutionary computation method.

New Trends in Computational Collective Intelligence

This book consists of 20 chapters in which the authors deal with different theoretical and practical aspects of new trends in Collective Computational Intelligence techniques. Computational Collective Intelligence methods and algorithms are one the current trending research topics from areas related to Artificial Intelligence, Soft Computing or Data Mining among others. Computational Collective Intelligence is a rapidly growing field that is most often understood as an AI sub-field dealing with soft computing methods which enable making group decisions and processing knowledge among autonomous units acting in distributed environments. Web-based Systems, Social Networks, and Multi-Agent Systems very often need these tools for working out consistent knowledge states, resolving conflicts and making decisions. The chapters included in this volume cover a selection of topics and new trends in several domains related to Collective Computational Intelligence: Language and Knowledge Processing, Data Mining Methods and Applications, Computer Vision, and Intelligent Computational Methods. This book will be useful for graduate and PhD students in computer science as well as for mature academics, researchers and practitioners interested in the methods and applications of collective computational intelligence in order to create new intelligent systems.

Interdisciplinary Advances in Information Technology Research

Over the last few decades, the constant developments in the IT field have expanded into nearly every discipline and aspect of life. Interdisciplinary Advances in Information Technology Research explores multiple fields and the research done as well as how they differentiate and relate to one another. This collection provides focused discussions from unique perspectives on the latest information technology research. Researchers, practitioners, and professionals will benefit from this publication's broad perspective.

Hybrid Artificial Intelligence Systems

The Third International Workshop on Hybrid Artificial Intelligence Systems (HAIS 2008) presented the most recent developments in the dynamically expanding realm of symbolic and sub-symbolic techniques aimed at the construction of highly robust and reliable problem-solving techniques. Hybrid intelligent systems have become increasingly popular given their capabilities to handle a broad spectrum of real-world complex problems which come with inherent imprecision, uncertainty and vagueness, high-dimensionality, and non stationarity. These systems provide us with the opportunity to exploit existing domain knowledge as well as raw data to come up with promising solutions

in an effective manner. Being truly multidisciplinary, the series of HAIS workshops offers a unique research forum to present and discuss the latest theoretical advances and real-world applications in this exciting research field. This volume of Lecture Notes on Artificial Intelligence (LNAI) includes accepted papers presented at HAIS 2008 held in University of Burgos, Burgos, Spain, September 2008. The global purpose of HAIS conferences has been to form a broad and interdisciplinary forum for hybrid artificial intelligence systems and associated learning paradigms, which are playing increasingly important roles in a large number of application areas. Since its first edition in Brazil in 2006, HAIS has become an important forum for researchers working on fundamental and theoretical aspects of hybrid artificial intelligence systems based on the use of agents and multiagent systems, bioinformatics and bio-inspired models, fuzzy systems, artificial vision, artificial neural networks, optimization models and alike.

Advances in Computational Intelligence

This volume comprises the proceedings of the International Conference on Computational Intelligence 2015 (ICCI15). This book aims to bring together work from leading academicians, scientists, researchers and research scholars from across the globe on all aspects of computational intelligence. The work is composed mainly of original and unpublished results of conceptual, constructive, empirical, experimental, or theoretical work in all areas of computational intelligence. Specifically, the major topics covered include classical computational intelligence models and artificial intelligence, neural networks and deep learning, evolutionary swarm and particle algorithms, hybrid systems optimization, constraint programming, human-machine interaction, computational intelligence for the web analytics, robotics, computational neurosciences, neurodynamics, bioinspired and biomorphic algorithms, cross disciplinary topics and applications. The contents of this volume will be of use to researchers and professionals alike.

NEO 2016

This volume comprises a selection of works presented at the Numerical and Evolutionary Optimization (NEO 2016) workshop held in September 2016 in Tlalnepantla, Mexico. The development of powerful search and optimization techniques is of great importance in today's world and requires researchers and practitioners to tackle a growing number of challenging real-world problems. In particular, there are two well-established and widely known fields that are commonly applied in this area: (i) traditional numerical optimization techniques and (ii) comparatively recent bio-inspired heuristics. Both paradigms have their unique strengths and weaknesses, allowing them to solve some challenging problems while still failing in others. The goal of the NEO workshop series is to bring together experts from these and related fields to discuss, compare and merge their complementary perspectives in order to develop fast and reliable hybrid methods that maximize the strengths and minimize the weaknesses of the underlying paradigms. In doing so, NEO promotes the development of new techniques that are applicable to a broader class of problems. Moreover, NEO fosters the understanding and adequate treatment of real-world problems particularly in emerging fields that affect all of us, such as healthcare, smart cities, big data, among many others. The extended papers presented in the book contribute to achieving this goal.

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