

Zong Woo Geem (Ed.)

Music-Inspired Harmony Search Algorithm

Theory and Applications



Springer

Music Inspired Harmony Search Algorithm Theory And Applications Studies In Computational Intelligence

**Patricia Melin, Oscar Castillo, Janusz
Kacprzyk**



Music Inspired Harmony Search Algorithm Theory And Applications Studies In Computational Intelligence:

Music-Inspired Harmony Search Algorithm Zong Woo Geem, 2009-05-12 Calculus has been used in solving many scientific and engineering problems. For optimization problems, however, the differential calculus technique sometimes has a drawback when the objective function is step wise discontinuous or multi modal or when decision variables are discrete rather than continuous. Thus researchers have recently turned their interests into metaheuristic algorithms that have been inspired by natural phenomena such as evolution, animal behavior or metallic annealing. This book especially focuses on a music inspired metaheuristic algorithm, harmony search. Interestingly, there exists an analogy between music and optimization: each musical instrument corresponds to each decision variable, musical note corresponds to variable value and harmony corresponds to solution vector. Just like musicians in Jazz improvisation play notes randomly or based on experiences in order to find fantastic harmony, variables in the harmony search algorithm have random values or previously memorized good values in order to find optimal solution.

Recent Advances in Harmony Search Algorithm Zong Woo Geem, 2010-01-12 Nowadays music inspired phenomenon mimicking harmony search algorithm is fast growing with many applications. One of key success factors of the algorithm is the employment of a novel stochastic derivative which can be used even for discrete variables. Instead of traditional calculus based gradient, the algorithm utilizes musician's experience as a derivative in searching for an optimal solution. This can be a new paradigm and main reason in the successes of various applications. The goal of this book is to introduce major advances of the harmony search algorithm in recent years. The book contains 14 chapters with the following subjects: State of the art in the harmony search algorithm, structure, robotics, robot terrain and manipulator trajectory, visual tracking, web text data mining, power flow planning, fuzzy control system, hybridization with Taguchi method or SQP method, groundwater management, irrigation, logistics, timetabling and bioinformatics, RNA structure prediction. This book collects the above mentioned theory and applications which are dispersed in various technical publications so that readers can have a good grasp of current status of the harmony search algorithm and foster new breakthroughs in their fields using the algorithm.

Music-Inspired Harmony Search Algorithm Zong Woo Geem, 2009-02-19 Calculus has been used in solving many scientific and engineering problems. For optimization problems, however, the differential calculus technique sometimes has a drawback when the objective function is step wise discontinuous or multi modal or when decision variables are discrete rather than continuous. Thus researchers have recently turned their interests into metaheuristic algorithms that have been inspired by natural phenomena such as evolution, animal behavior or metallic annealing. This book especially focuses on a music inspired metaheuristic algorithm, harmony search. Interestingly, there exists an analogy between music and optimization: each musical instrument corresponds to each decision variable, musical note corresponds to variable value and harmony corresponds to solution vector. Just like musicians in Jazz improvisation play notes randomly or based on experiences in order to find fantastic harmony, variables in the harmony

search algorithm have random values or previously memorized good values in order to find optimal solution

Nature-Inspired Computing Nazmul H. Siddique, Hojjat Adeli, 2017-05-19 Nature Inspired Computing Physics and Chemistry Based Algorithms provides a comprehensive introduction to the methodologies and algorithms in nature inspired computing with an emphasis on applications to real life engineering problems The research interest for Nature inspired Computing has grown considerably exploring different phenomena observed in nature and basic principles of physics chemistry and biology The discipline has reached a mature stage and the field has been well established This endeavour is another attempt at investigation into various computational schemes inspired from nature which are presented in this book with the development of a suitable framework and industrial applications Designed for senior undergraduates postgraduates research students and professionals the book is written at a comprehensible level for students who have some basic knowledge of calculus and differential equations and some exposure to optimization theory Due to the focus on search and optimization the book is also appropriate for electrical control civil industrial and manufacturing engineering business and economics students as well as those in computer and information sciences With the mathematical and programming references and applications in each chapter the book is self contained and can also serve as a reference for researchers and scientists in the fields of system science natural computing and optimization

Advances in Machine Learning and Computational Intelligence Srikantha Patnaik, Xin-She Yang, Ishwar K. Sethi, 2020-07-25 This book gathers selected high quality papers presented at the International Conference on Machine Learning and Computational Intelligence ICMLCI 2019 jointly organized by Kunming University of Science and Technology and the Interscience Research Network Bhubaneswar India from April 6 to 7 2019 Addressing virtually all aspects of intelligent systems soft computing and machine learning the topics covered include prediction data mining information retrieval game playing robotics learning methods pattern visualization automated knowledge acquisition fuzzy stochastic and probabilistic computing neural computing big data social networks and applications of soft computing in various areas

Computational Optimization and Applications in Engineering and Industry Xin-She Yang, Slawomir Koziel, 2011-06-19 Contemporary design in engineering and industry relies heavily on computer simulation and efficient algorithms to reduce the cost and to maximize the performance and sustainability as well as profits and energy efficiency Solving an optimization problem correctly and efficiently requires not only the right choice of optimization algorithms and simulation methods but also the proper implementation and insight into the problem of interest This book consists of ten self contained detailed case studies of real world optimization problems selected from a wide range of applications and contributed from worldwide experts who are working in these exciting areas Optimization topics and applications include gas and water supply networks oil field production optimization microwave engineering aerodynamic shape design environmental emergence modelling structural engineering waveform design for radar and communication systems parameter estimation in laser experiment and measurement engineering materials and

network scheduling These case studies have been solved using a wide range of optimization techniques including particle swarm optimization genetic algorithms artificial bee colony harmony search adaptive error control derivative free pattern search surrogate based optimization variable fidelity modelling as well as various other methods and approaches This book is a practical guide to help graduates and researchers to carry out optimization for real world applications More advanced readers will also find it a helpful reference and aide memoire

Nature-inspired Metaheuristic Algorithms

Xin-She Yang,2010 Modern metaheuristic algorithms such as particle swarm optimization and cuckoo search start to demonstrate their power in dealing with tough optimization problems and even NP hard problems This book reviews and introduces the state of the art nature inspired metaheuristic algorithms for global optimization including ant and bee algorithms bat algorithm cuckoo search differential evolution firefly algorithm genetic algorithms harmony search particle swarm optimization simulated annealing and support vector machines In this revised edition we also include how to deal with nonlinear constraints Worked examples with implementation have been used to show how each algorithm works This book is thus an ideal textbook for an undergraduate and or graduate course as well as for self study As some of the algorithms such as the cuckoo search and firefly algorithms are at the forefront of current research this book can also serve as a reference for researchers

Nature-Inspired Design of Hybrid Intelligent Systems

Patricia Melin,Oscar Castillo,Janusz Kacprzyk,2016-12-08 This book highlights recent advances in the design of hybrid intelligent systems based on 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 divided into seven main parts the first of which addresses theoretical aspects of and new concepts and algorithms based on type 2 and intuitionistic fuzzy logic systems The second part focuses on neural network theory and explores the applications of neural networks in diverse areas such as time series prediction and pattern recognition The book s third part presents enhancements to meta heuristics based on fuzzy logic techniques and describes new nature inspired optimization algorithms that employ fuzzy dynamic adaptation of parameters while the fourth part presents diverse applications of nature inspired optimization algorithms In turn the fifth part investigates applications of fuzzy logic in diverse areas such as time series prediction and pattern recognition The sixth part examines new optimization algorithms and their applications Lastly the seventh part is dedicated to the design and application of different hybrid intelligent systems

Nature-Inspired Optimization Algorithms

Xin-She Yang,2014-02-17 Nature Inspired Optimization Algorithms provides a systematic introduction to all major nature inspired algorithms for optimization The book s unified approach balancing algorithm introduction theoretical background and practical implementation complements extensive literature with well chosen case studies to illustrate how these algorithms work Topics include particle swarm optimization ant and bee algorithms simulated annealing cuckoo search firefly algorithm bat algorithm flower algorithm harmony search algorithm analysis constraint handling hybrid methods parameter tuning and

control as well as multi objective optimization This book can serve as an introductory book for graduates doctoral students and lecturers in computer science engineering and natural sciences It can also serve a source of inspiration for new applications Researchers and engineers as well as experienced experts will also find it a handy reference Discusses and summarizes the latest developments in nature inspired algorithms with comprehensive timely literature Provides a theoretical understanding as well as practical implementation hints Provides a step by step introduction to each algorithm

Computational Intelligence Methods for Sentiment Analysis in Natural Language Processing Applications D.

Jude Hemanth,2024-01-19 Sentiment Analysis has become increasingly important in recent years for nearly all online applications Sentiment Analysis depends heavily on Artificial Intelligence AI technology wherein computational intelligence approaches aid in deriving the opinions emotions of human beings With the vast increase in Big Data computational intelligence approaches have become a necessity for Natural Language Processing and Sentiment Analysis in a wide range of decision making application areas The applications of Sentiment Analysis are enormous ranging from business to biomedical and clinical applications However the combination of AI methods and Sentiment Analysis is one of the rarest commodities in the literature The literatures either gives more importance to the application alone or to the AI CI methodology Computational Intelligence for Sentiment Analysis in Natural Language Processing Applications provides a solution to this problem through detailed technical coverage of AI based Sentiment Analysis methods for various applications The authors provide readers with an in depth look at the challenges and solutions associated with the different types of Sentiment Analysis including case studies and real world scenarios from across the globe Development of scientific and enterprise applications are covered which will aid computer scientists in building practical real world AI based Sentiment Analysis systems Includes basic concepts technical explanations and case studies for in depth explanation of the Sentiment Analysis Aids computer scientists in developing practical real world AI based Sentiment Analysis systems Provides readers with real world development applications of AI based Sentiment Analysis including transfer learning for opinion mining from pandemic medical data sarcasm detection using neural networks in human computer interaction and emotion detection using the random forest algorithm

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

Fuzzy Logic Augmentation of Neural and Optimization Algorithms: Theoretical Aspects and Real Applications Oscar Castillo, Patricia Melin, Janusz Kacprzyk, 2018-01-10 This book comprises papers on diverse aspects of fuzzy logic neural networks and nature inspired optimization meta heuristics and their application in various areas such as intelligent control and robotics pattern recognition medical diagnosis time series prediction and optimization of complex problems The book is organized into seven main parts each with a collection of papers on a similar subject The first part presents new concepts and algorithms based on type 2 fuzzy logic for dynamic parameter adaptation in meta heuristics The second part discusses network theory and applications and includes papers describing applications of neural networks in diverse areas such as time series prediction and pattern recognition The third part addresses the theory and practice of meta heuristics in different areas of application while the fourth part describes diverse fuzzy logic applications in the control area which can be considered as intelligent controllers The next two parts explore applications in areas such as time series prediction and pattern recognition and new optimization and evolutionary algorithms and their applications respectively Lastly the seventh part addresses the design and application of different hybrid intelligent systems

Advances in Artificial Intelligence and Its Applications Obdulia Pichardo Lagunas, Oscar Herrera Alcántara, Gustavo Arroyo Figueroa, 2015-11-19 The two volume set LNAI 9413 9414 constitutes the proceedings of the 14th Mexican International Conference on Artificial Intelligence MICA 2015 held in Cuernavaca Morelos Mexico in October 2015 The total of 98 papers presented in these proceedings was carefully reviewed and selected from 297 submissions They were organized in topical sections named natural language processing logic and multi agent systems bioinspired algorithms neural networks evolutionary algorithms fuzzy logic machine learning and data mining natural language processing applications educational applications biomedical applications image processing and computer vision search and optimization forecasting and intelligent applications

Hybrid Computational Intelligence Siddhartha Bhattacharyya, Václav Snášel, Indrajit Pan, Debashis De, 2019-09-30 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 *Sheet Metal Forming Optimization* Ganesh M. Kakandikar,Vilas M. Nandedkar,2017-10-16 Automotive and aerospace components utensils and many other products are manufactured by a forming drawing process on press machines of very thin sheet metal 0.8 to 1.2 mm It is imperative to study the effect of all involved parameters on output of this type of manufacturing process This book offers the readers with application and suitability of various evolutionary swarm and bio inspired optimization algorithms for sheet metal forming processes Book initiates by presenting basics of metal forming formability followed by discussion of process parameters in detail prominent modes of failure basics of optimization and various bioinspired approaches followed by optimization studies on various industrial components applying bioinspired optimization algorithms Key Features Focus on description of basic investigation of metal forming as well as evolutionary optimization Presentation of innovative optimization methodologies to close the gap between those formulations and industrial problems aimed at industrial professionals Includes mathematical modeling of drawing forming process Discusses key performance parameters such as Thinning Fracture and Wrinkling Includes both numerical and experimental analysis **Advances in Soft Computing and Its Applications** Félix Castro,Alexander Gelbukh,Miguel González,2013-11-18 The two volume set LNAI 8265 and LNAI 8266 constitutes the proceedings of the 12th Mexican International Conference on Artificial Intelligence MICA 2013 held in Mexico City Mexico in November 2013 The total of 85 papers presented in these proceedings were carefully reviewed and selected from 284 submissions The first volume deals with advances in artificial intelligence and its applications and is structured in the following five sections logic and reasoning knowledge based systems and multi agent systems natural language processing machine translation and bioinformatics and medical applications The second volume deals with advances in soft computing and its applications and is structured in the following eight sections evolutionary and nature inspired metaheuristic algorithms neural networks and hybrid intelligent systems fuzzy systems machine learning and pattern recognition data mining computer vision and image processing robotics planning and scheduling and emotion detection sentiment analysis and opinion mining

Nature-Inspired Algorithms for Optimisation Raymond Chiong,2009-05-02 Nature Inspired Algorithms have been gaining much popularity in recent years due to the fact that many real world optimisation problems have become increasingly large complex and dynamic The size and complexity of the problems nowadays require the development of methods and solutions whose efficiency is measured by their ability to find acceptable results within a reasonable amount of time rather than an ability to guarantee the optimal solution This volume Nature Inspired Algorithms for Optimisation is a collection of the latest state of the art algorithms and important studies for tackling various kinds of optimisation problems It comprises 18 chapters including two introductory chapters which address the fundamental issues that have made optimisation problems difficult to solve and explain the rationale for seeking inspiration from nature The contributions stand out through their novelty and clarity of the algorithmic descriptions and analyses and lead the way to interesting and varied

new applications *Foundations of Computational Intelligence* Ajith Abraham, Aboul-Ella Hassanien, Athanasios V. Vasilakos, Witold Pedrycz, 2009-05-05 Recent years have seen numerous applications across a variety of fields using various techniques of Computational Intelligence This book one of a series on the foundations of Computational Intelligence is focused on learning and approximation **Recent Advances in Swarm Intelligence and Evolutionary Computation**

Xin-She Yang, 2014-12-27 This timely review volume summarizes the state of the art developments in nature inspired algorithms and applications with the emphasis on swarm intelligence and bio inspired computation Topics include the analysis and overview of swarm intelligence and evolutionary computation hybrid metaheuristic algorithms bat algorithm discrete cuckoo search firefly algorithm particle swarm optimization and harmony search as well as convergent hybridization Application case studies have focused on the dehydration of fruits and vegetables by the firefly algorithm and goal programming feature selection by the binary flower pollination algorithm job shop scheduling single row facility layout optimization training of feed forward neural networks damage and stiffness identification synthesis of cross ambiguity functions by the bat algorithm web document clustering truss analysis water distribution networks sustainable building designs and others As a timely review this book can serve as an ideal reference for graduates lecturers engineers and researchers in computer science evolutionary computing artificial intelligence machine learning computational intelligence data mining engineering optimization and designs *Foundations of Computational Intelligence Volume 5* Ajith

Abraham, Aboul-Ella Hassanien, Vaclav Sná#el, 2009-06-30 Foundations of Computational Intelligence Volume 5 Function Approximation and Classification Approximation theory is that area of analysis which is concerned with the ability to approximate functions by simpler and more easily calculated functions It is an area which like many other fields of analysis has its primary roots in the mathematics The need for function approximation and classification arises in many branches of applied mathematics computer science and data mining in particular This edited volume comprises of 14 chapters including several overview Chapters which provides an up to date and state of the art research covering the theory and algorithms of function approximation and classification Besides research articles and expository papers on theory and algorithms of function approximation and classification papers on numerical experiments and real world applications were also encouraged The Volume is divided into 2 parts Part I Function Approximation and Classification Theoretical Foundations Part II Function Approximation and Classification Success Stories and Real World Applications Part I on Function Approximation and Classification Theoretical Foundations contains six chapters that describe several approaches Feature Selection the use Decomposition of Correlation Integral Some Issues on Extensions of Information and Dynamic Information System and a Probabilistic Approach to the Evaluation and Combination of Preferences Chapter 1 Feature Selection for Partial Least Square Based Dimension Reduction by Li and Zeng investigate a systematic feature reduction framework by combining dimension reduction with feature selection To evaluate the proposed framework authors used four typical data sets

The Enigmatic Realm of **Music Inspired Harmony Search Algorithm Theory And Applications Studies In Computational Intelligence**: Unleashing the Language is Inner Magic

In a fast-paced digital era where connections and knowledge intertwine, the enigmatic realm of language reveals its inherent magic. Its capacity to stir emotions, ignite contemplation, and catalyze profound transformations is nothing in short supply of extraordinary. Within the captivating pages of **Music Inspired Harmony Search Algorithm Theory And Applications Studies In Computational Intelligence** a literary masterpiece penned by a renowned author, readers attempt a transformative journey, unlocking the secrets and untapped potential embedded within each word. In this evaluation, we shall explore the book's core themes, assess its distinct writing style, and delve into its lasting affect the hearts and minds of people who partake in its reading experience.

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