NATURAL COMPUTING SERIES

Julian F. Miller (Ed.)

Cartesian Genetic Programming

Springer

Cartesian Genetic Programming Natural Computing Series

Stephan M. Winkler,Wolfgang Banzhaf,Ting Hu,Alexander Lalejini

Cartesian Genetic Programming Natural Computing Series:

Cartesian Genetic Programming Julian F. Miller,2011-09-18 Cartesian Genetic Programming CGP is a highly effective and increasingly popular form of genetic programming It represents programs in the form of directed graphs and a particular characteristic is that it has a highly redundant genotype phenotype mapping in that genes can be noncoding It has spawned a number of new forms each improving on the efficiency among them modular or embedded CGP and self modifying CGP It has been applied to many problems in both computer science and applied sciences This book contains chapters written by the leading figures in the development and application of CGP and it will be essential reading for researchers in genetic programming and for engineers and scientists solving applications using these techniques It will also be useful for advanced undergraduates and postgraduates seeking to understand and utilize a highly efficient form of genetic programming

Genetic Programming Theory and Practice X Rick Riolo,Ekaterina Vladislavleva,Marylyn D Ritchie,Jason H. Moore,2013-05-24 These contributions written by the foremost international researchers and practitioners of Genetic Programming GP explore the synergy between theoretical and empirical results on real world problems producing a comprehensive view of the state of the art in GP Topics in this volume include evolutionary constraints relaxation of selection mechanisms diversity preservation strategies flexing fitness evaluation evolution in dynamic environments multi objective and multi modal selection foundations of evolvability evolvable and adaptive evolutionary operators foundation of injecting expert knowledge in evolutionary search analysis of problem difficulty and required GP algorithm complexity foundations in running GP on the cloud communication cooperation flexible implementation and ensemble methods Additional focal points for GP symbolic regression are 1 The need to guarantee convergence to solutions in the function discovery mode 2 Issues on model validation 3 The need for model analysis workflows for insight generation based on generated GP solutions model exploration visualization variable selection dimensionality analysis 4 Issues in combining different types of data Readers will discover large scale real world applications of GP to a variety of problem domains via in depth presentations of the latest and most significant results *Massively Parallel Evolutionary Computation on GPGPUs* Shigeyoshi Tsutsui,Pierre Collet,2013-12-05 Evolutionary algorithms EAs are metaheuristics that learn from natural collective behavior and are applied to solve optimization problems in domains such as scheduling engineering bioinformatics and finance Such applications demand acceptable solutions with high speed execution using finite computational resources Therefore there have been many attempts to develop platforms for running parallel EAs using multicore machines massively parallel cluster machines or grid computing environments Recent advances in general purpose computing on graphics processing units GPGPU have opened up this possibility for parallel EAs and this is the first book dedicated to this exciting development The three chapters of Part I are tutorials representing a comprehensive introduction to the approach explaining the characteristics of the hardware used and presenting a representative project to develop a platform for automatic parallelization of evolutionary

computing EC on GPGPUs The 10 chapters in Part II focus on how to consider key EC approaches in the light of this advanced computational technique in particular addressing generic local search tabu search genetic algorithms differential evolution swarm optimization ant colony optimization systolic genetic search genetic programming and multiobjective optimization The 6 chapters in Part III present successful results from real world problems in data mining bioinformatics drug discovery crystallography artificial chemistries and sudoku Although the parallelism of EAs is suited to the single instruction multiple data SIMD based GPU there are many issues to be resolved in design and implementation and a key feature of the contributions is the practical engineering advice offered This book will be of value to researchers practitioners and graduate students in the areas of evolutionary computation and scientific computing **Parallel Problem Solving from Nature -- PPSN XIII** Thomas Bartz-Beielstein,Juergen Branke,Bogdan Filipič,James Smith,2014-09-11 This book constitutes the refereed proceedings of the 13th International Conference on Parallel Problem Solving from Nature PPSN 2013 held in Ljubljana Slovenia in September 2014 The total of 90 revised full papers were carefully reviewed and selected from 217 submissions The meeting began with 7 workshops which offered an ideal opportunity to explore specific topics in evolutionary computation bio inspired computing and metaheuristics PPSN XIII also included 9 tutorials The papers are organized in topical sections on adaption self adaption and parameter tuning classifier system differential evolution and swarm intelligence coevolution and artificial immune systems constraint handling dynamic and uncertain environments estimation of distribution algorithms and metamodelling genetic programming multi objective optimisation parallel algorithms and hardware implementations real world applications and theory **Mathematical and Engineering Methods in Computer Science** Petr Hliněný,Zdeněk Dvořák,Jiří Jaroš,Jan Kofroň,Jan Kořenek,Petr Matula,Karel Pala,2014-12-31 This volume contains the post proceedings of the 9th Doctoral Workshop on Mathematical and Engineering Methods in Computer Science MEMICS 2014 held in Tel Czech Republic in October 2014 The 13 thoroughly revised papers were carefully selected out of 28 submissions and are presented together with 4 invited papers The topics covered by the papers include algorithms logic and games high performance computing computer aided analysis verification and testing hardware design and diagnostics computer graphics and image processing and artificial intelligence and natural language processing Growing Adaptive Machines Taras Kowaliw,Nicolas Bredeche,René Doursat,2014-06-04 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 desi gn 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 **Intelligent Systems** Ricardo Cerri,Ronaldo C. Prati,2020-10-15 The two volume set LNAI 12319 and 12320 constitutes the proceedings of the 9th Brazilian Conference on Intelligent Systems BRACIS 2020 held in Rio Grande Brazil in October 2020 The total of 90 papers presented in these two volumes was carefully reviewed and selected from 228 submissions The contributions are organized in the following topical section Part I Evolutionary computation metaheuristics constrains and search combinatorial and numerical optimization neural networks deep learning and computer vision and text mining and natural language processing Part II Agent and multi agent systems planning and reinforcement learning knowledge representation logic and fuzzy systems machine learning and data mining and multidisciplinary artificial and computational intelligence and applications Due to the Corona pandemic BRACIS 2020 was held as a virtual event Progress in Artificial Intelligence Eugénio Oliveira,João Gama,Zita Vale,Henrique Lopes Cardoso,2017-08-24 This book constitutes the refereed proceedings of the 18th EPIA Conference on Artificial Intelligence EPIA 2017 held in Porto Portugal in September 2017 The 69 revised full papers and 2 short papers presented were carefully reviewed and selected from a total of 177 submissions The papers are organized in 16 tracks devoted to the following topics agent based modelling for criminological research ABM4Crime artificial intelligence in cyber physical and distributed embedded systems AICPDES artificial intelligence in games AIG artificial intelligence in medicine AIM artificial intelligence in power and energy systems AIPES artificial intelligence in transportation systems AITS artificial life and evolutionary algorithms ALEA ambient intelligence and affective environments AmIA business applications of artificial intelligence BAAI intelligent robotics IROBOT knowledge discovery and business intelligence KDBI knowledge representation and reasoning KRR multi agent systems theory and applications MASTA software engineering for autonomous and intelligent systems SE4AIS social simulation and modelling SSM and text mining and applications TeMA **Network and System Security** Meikang Qiu,Shouhuai Xu,Moti Yung,Haibo Zhang,2015-11-23 This book constitutes the proceedings of the 9th International Conference on Network and System Security NSS 2015 held in New York City NY USA in November 2015 The 23 full papers and 18 short papers presented were carefully reviewed and selected from 110 submissions The

papers are organized in topical sections on wireless security and privacy smartphone security systems security applications security security management applied cryptography cryptosystems cryptographic mechanisms security mechanisms mobile and cloud security applications and network security *Innovative Security Solutions for Information Technology and Communications* Jean-Louis Lanet,Cristian Toma,2019-02-05 This book constitutes the thoroughly refereed proceedings of the 11th International Conference on Security for Information Technology and Communications SecITC 2018 held in Bucharest Romania in November 2018 The 35 revised full papers presented together with 3 invited talks were carefully reviewed and selected from 70 submissions The papers present advances in the theory design implementation analysis verification or evaluation of secure systems and algorithms **Genetic Programming** ,2004 **Genetic and Evolutionary Computation Conference** ,2005 **Genetic Programming** Julian F. Miller,2001-04-04 This book constitutes the refereed proceedings of the 4th European Conference on Genetic Programming EuroGP 2001 held at Lake Como Italy in April 2001 The 17 revised full papers and 13 research posters presented were carefully reviewed and selected during a rigorous double blind refereeing process out of 42 submissions All current aspects of genetic programming are addressed ranging from theoretical and foundational issues to applications in a variety of fields such as robotics artificial retina character recognition financial prediction digital filter and electronic circuit design image processing data fusion and bio sequencing **Inspired by Nature** Susan Stepney,Andrew Adamatzky,2017-10-25 This book is a tribute to Julian Francis Miller s ideas and achievements in computer science evolutionary algorithms and genetic programming electronics unconventional computing artificial chemistry and theoretical biology Leading international experts in computing inspired by nature offer their insights into the principles of information processing and optimisation in simulated and experimental living physical and chemical substrates Miller invented Cartesian Genetic Programming CGP in 1999 from a representation of electronic circuits he devised with Thomson a few years earlier The book presents a number of CGP s wide applications including multi step ahead forecasting solving artificial neural networks dogma approximate computing medical informatics control engineering evolvable hardware and multi objective evolutionary optimisations The book addresses in depth the technique of Evolution in Materio a term coined by Miller and Downing using a range of examples of experimental prototypes of computing in disordered ensembles of graphene nanotubes slime mould plants and reaction diffusion chemical systems Advances in sub symbolic artificial chemistries artificial bio inspired development code evolution with genetic programming and using Reed Muller expansions in the synthesis of Boolean quantum circuits add a unique flavour to the content The book is a pleasure to explore for readers from all walks of life from undergraduate students to university professors from mathematicians computer scientists and engineers to chemists and biologists *Genetic Programming in the Context of Natural Computing* Hubert Schölnast,2010-08 Bachelor Thesis from the year 2009 in the subject Computer Science Programming grade 1 University of Applied Sciences Technikum Vienna Informations und Kommunikationssysteme language

English abstract From the sector Natural Computing simulation of natural Phenomena hardware from nature nature borrowed methods etc the area Biological inspired Computing is selected and described A systematic literature analysis of this field of research over the past 30 years shows that after a boom in neural networks in the 1990s in the last five years genetic algorithms including particularly the methods of genetic programming came to the foreground In this heuristic procedure computer programs are optimized in an iterative loop In the startup phase programs will be randomly generated In a frequently recurring cycle the steps program execution evaluation of results determination of fitness selection and diversification especially crossover and mutation are used to grow better programs from generation to generation This work shows criteria to decide in favor of whether or not to use genetic programming Proven and experimental methods are presented for all phases of the optimization process and one will find a short survey on how far these methods correlate to their natural role model This thesis also refers to common problems such as Bloat A library of methods collected by the author forms a mixture of a cookbook and a toolbox to be used in Genetic Programming Finally this thesis provides some examples where with the help of genetic programming award winning practical applications have been created which in many cases have outperformed conventionally obtained results **GECCO-99** ,1999 These proceedings contain the papers presented at the GECCO conference held in Orlando Florida July 13 17 1999 The 1999 Genetic and Evolutionary Computational Conference GECCO 99 combined the longest running conferences in evolutionary computation ICGA and the world s two largest EC conferences GP and ICGA to create a unique opportunity to collect the best in research in this growing field of computer science and engineering **GECCO 2005** Hans-Georg Beyer,2005 **Genetic Programming Theory and Practice XXI** Stephan M. Winkler,Wolfgang Banzhaf,Ting Hu,Alexander Lalejini,2025-02-27 This book brings together some of the most impactful researchers in the field of genetic programming GP each one working on unique and interesting intersections of theoretical development and practical applications of this evolutionary based machine learning paradigm Topics of particular interest for this year s book include powerful modeling techniques through GP based symbolic regression novel selection mechanisms that help guide the evolutionary process modular approaches to GP and applications in cybersecurity biomedicine and program synthesis as well as papers by practitioner of GP that focus on usability and real world results In summary readers will get a glimpse of the current state of the art in GP research *Genetic and Evolutionary Computation Conference* Hans-Georg Beyer,2005 **Advances in Artificial Life** ,2003

The Top Books of the Year Cartesian Genetic Programming Natural Computing Series The year 2023 has witnessed a noteworthy surge in literary brilliance, with numerous compelling novels enthralling the hearts of readers worldwide. Lets delve into the realm of top-selling books, exploring the fascinating narratives that have enthralled audiences this year. Cartesian Genetic Programming Natural Computing Series : Colleen Hoovers "It Ends with Us" This poignant tale of love, loss, and resilience has captivated readers with its raw and emotional exploration of domestic abuse. Hoover expertly weaves a story of hope and healing, reminding us that even in the darkest of times, the human spirit can triumph. Uncover the Best : Taylor Jenkins Reids "The Seven Husbands of Evelyn Hugo" This captivating historical fiction novel unravels the life of Evelyn Hugo, a Hollywood icon who defies expectations and societal norms to pursue her dreams. Reids absorbing storytelling and compelling characters transport readers to a bygone era, immersing them in a world of glamour, ambition, and self-discovery. Cartesian Genetic Programming Natural Computing Series : Delia Owens "Where the Crawdads Sing" This captivating coming-of-age story follows Kya Clark, a young woman who grows up alone in the marshes of North Carolina. Owens spins a tale of resilience, survival, and the transformative power of nature, captivating readers with its evocative prose and mesmerizing setting. These top-selling novels represent just a fraction of the literary treasures that have emerged in 2023. Whether you seek tales of romance, adventure, or personal growth, the world of literature offers an abundance of compelling stories waiting to be discovered. The novel begins with Richard Papen, a bright but troubled young man, arriving at Hampden College. Richard is immediately drawn to the group of students who call themselves the Classics Club. The club is led by Henry Winter, a brilliant and charismatic young man. Henry is obsessed with Greek mythology and philosophy, and he quickly draws Richard into his world. The other members of the Classics Club are equally as fascinating. Bunny Corcoran is a wealthy and spoiled young man who is always looking for a good time. Charles Tavis is a quiet and reserved young man who is deeply in love with Henry. Camilla Macaulay is a beautiful and intelligent young woman who is drawn to the power and danger of the Classics Club. The students are all deeply in love with Morrow, and they are willing to do anything to please him. Morrow is a complex and mysterious figure, and he seems to be manipulating the students for his own purposes. As the students become more involved with Morrow, they begin to commit increasingly dangerous acts. The Secret History is a brilliant and thrilling novel that will keep you wondering until the very end. The novel is a cautionary tale about the dangers of obsession and the power of evil.

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