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Advances in Metaheuristics - Timothy Ganesan 2016-11-28

Advances in Metaheuristics: Applications in Engineering Systems provides details on current approaches utilized in engineering optimization. It gives a comprehensive background on metaheuristic applications, focusing on main engineering sectors such as energy, process, and materials. It discusses topics such as algorithmic enhancements and performance measurement approaches, and provides insights into the implementation of metaheuristic strategies to multi-objective optimization problems. With this book, readers can learn to solve real-world engineering optimization problems effectively using the appropriate techniques from emerging fields including evolutionary and swarm intelligence, mathematical programming, and multi-objective optimization. The ten chapters of this book are divided into three parts. The first part discusses three industrial applications in the energy sector. The second focusses on process optimization and considers three engineering applications: optimization of a three-phase separator, process plant, and a pre-treatment process. The third and final part of

this book covers industrial applications in material engineering, with a particular focus on sand mould-systems. It also includes discussions on the potential improvement of algorithmic characteristics via strategic algorithmic enhancements. This book helps fill the existing gap in literature on the implementation of metaheuristics in engineering applications and real-world engineering systems. It will be an important resource for engineers and decision-makers selecting and implementing metaheuristics to solve specific engineering problems.

Practical Hydroinformatics - Robert J. Abrahart 2008-10-24

Hydroinformatics is an emerging subject that is expected to gather speed, momentum and critical mass throughout the forthcoming decades of the 21st century. This book provides a broad account of numerous advances in that field - a rapidly developing discipline covering the application of information and communication technologies, modelling and computational intelligence in aquatic environments. A systematic survey, classified according to the methods used (neural networks, fuzzy logic and evolutionary optimization, in particular) is offered, together

with illustrated practical applications for solving various water-related issues. ...

Data Sketches - Nadieh Bremer 2021-02-09

In *Data Sketches*, Nadieh Bremer and Shirley Wu document the deeply creative process behind 24 unique data visualization projects, and they combine this with powerful technical insights which reveal the mindset behind coding creatively. Exploring 12 different themes - from the Olympics to Presidents & Royals and from Movies to Myths & Legends - each pair of visualizations explores different technologies and forms, blurring the boundary between visualization as an exploratory tool and an artform in its own right. This beautiful book provides an intimate, behind-the-scenes account of all 24 projects and shares the authors' personal notes and drafts every step of the way. The book features: Detailed information on data gathering, sketching, and coding data visualizations for the web, with screenshots of works-in-progress and reproductions from the authors' notebooks Never-before-published technical write-ups, with beginner-friendly explanations of core data visualization concepts Practical lessons based on the data and design challenges overcome during each project Full-color pages, showcasing all 24 final data visualizations This book is perfect for anyone interested or working in data visualization and information design, and especially those who want to take their work to the next level and are inspired by unique and compelling data-driven storytelling.

Biological Computation - Ehud Lamm 2011-05-25

The area of biologically inspired computing, or biological computation, involves the development of new, biologically based techniques for solving difficult computational problems. A unified overview of computer science ideas inspired by biology, *Biological Computation* presents the most fundamental and significant concepts in this area. In the book, students discover that bacteria communicate, that DNA can be used for performing computations, how evolution solves optimization problems, that the way ants organize their nests can be applied to solve clustering problems, and what the human immune system can teach us about protecting computer networks. The authors discuss more biological

examples such as these, along with the computational techniques developed from these scenarios. The text focuses on cellular automata, evolutionary computation, neural networks, and molecular computation. Each chapter explores the biological background, describes the computational techniques, gives examples of applications, discusses possible variants of the techniques, and includes exercises and solutions. The authors use the examples and exercises to illustrate key ideas and techniques. Clearly conveying the essence of the major computational approaches in the field, this book brings students to the point where they can either produce a working implementation of the techniques or effectively use one of the many available implementations. Moreover, the techniques discussed reflect fundamental principles that can be applied beyond bio-inspired computing. Supplementary material is available on Dr. Unger's website.

Mindstorms - Seymour A. Papert 2020-10-06

In this revolutionary book, a renowned computer scientist explains the importance of teaching children the basics of computing and how it can prepare them to succeed in the ever-evolving tech world. Computers have completely changed the way we teach children. We have *Mindstorms* to thank for that. In this book, pioneering computer scientist Seymour Papert uses the invention of LOGO, the first child-friendly programming language, to make the case for the value of teaching children with computers. Papert argues that children are more than capable of mastering computers, and that teaching computational processes like de-bugging in the classroom can change the way we learn everything else. He also shows that schools saturated with technology can actually improve socialization and interaction among students and between students and teachers. Technology changes every day, but the basic ways that computers can help us learn remain. For thousands of teachers and parents who have sought creative ways to help children learn with computers, *Mindstorms* is their bible.

Introduction to Computing - David Evans 2011-12-07

Introduction to Computing is a comprehensive text designed for the CS0 (Intro to CS) course at the college level. It may also be used as a primary

text for the Advanced Placement Computer Science course at the high school level.

The Computational Beauty of Nature - Gary William Flake 2000-01-27
Gary William Flake develops in depth the simple idea that recurrent rules can produce rich and complicated behaviors. In this book Gary William Flake develops in depth the simple idea that recurrent rules can produce rich and complicated behaviors. Distinguishing "agents" (e.g., molecules, cells, animals, and species) from their interactions (e.g., chemical reactions, immune system responses, sexual reproduction, and evolution), Flake argues that it is the computational properties of interactions that account for much of what we think of as "beautiful" and "interesting." From this basic thesis, Flake explores what he considers to be today's four most interesting computational topics: fractals, chaos, complex systems, and adaptation. Each of the book's parts can be read independently, enabling even the casual reader to understand and work with the basic equations and programs. Yet the parts are bound together by the theme of the computer as a laboratory and a metaphor for understanding the universe. The inspired reader will experiment further with the ideas presented to create fractal landscapes, chaotic systems, artificial life forms, genetic algorithms, and artificial neural networks.

Turtles, Termites, and Traffic Jams - Mitchel Resnick 1997-01-22
How does a bird flock keep its movements so graceful and synchronized? Most people assume that the bird in front leads and the others follow. In fact, bird flocks don't have leaders: they are organized without an organizer, coordinated without a coordinator. And a surprising number of other systems, from termite colonies to traffic jams to economic systems, work the same decentralized way. **Turtles, Termites, and Traffic Jams** describes innovative new computational tools that can help people (even young children) explore the workings of such systems—and help them move beyond the centralized mindset.

Engineering Self-Organising Systems - Sven A. Brueckner
2005-05-24

Self-organisation, self-regulation, self-repair, and self-maintenance are promising conceptual approaches to deal with the ever increasing

complexity of distributed interacting software and information handling systems. Self-organising applications are able to dynamically change their functionality and structure without direct user intervention to respond to changes in requirements and the environment. This book comprises revised and extended papers presented at the International Workshop on Engineering Self-Organising Applications, ESOA 2004, held in New York, NY, USA in July 2004 at AAMAS as well as invited papers from leading researchers. The papers are organized in topical sections on state of the art, synthesis and design methods, self-assembly and robots, stigmergy and related topics, and industrial applications.

Code as Creative Medium - Golan Levin 2021-02-02

An essential guide for teaching and learning computational art and design: exercises, assignments, interviews, and more than 170 illustrations of creative work. This book is an essential resource for art educators and practitioners who want to explore code as a creative medium, and serves as a guide for computer scientists transitioning from STEM to STEAM in their syllabi or practice. It provides a collection of classic creative coding prompts and assignments, accompanied by annotated examples of both classic and contemporary projects, and more than 170 illustrations of creative work, and features a set of interviews with leading educators. Picking up where standard programming guides leave off, the authors highlight alternative programming pedagogies suitable for the art- and design-oriented classroom, including teaching approaches, resources, and community support structures.

Introduction to Computational Mathematics - Xin-She Yang 2014-11-26
This unique book provides a comprehensive introduction to computational mathematics, which forms an essential part of contemporary numerical algorithms, scientific computing and optimization. It uses a theorem-free approach with just the right balance between mathematics and numerical algorithms. This edition covers all major topics in computational mathematics with a wide range of carefully selected numerical algorithms, ranging from the root-finding algorithm, numerical integration, numerical methods of partial differential equations, finite element methods, optimization algorithms, stochastic

models, nonlinear curve-fitting to data modelling, bio-inspired algorithms and swarm intelligence. This book is especially suitable for both undergraduates and graduates in computational mathematics, numerical algorithms, scientific computing, mathematical programming, artificial intelligence and engineering optimization. Thus, it can be used as a textbook and/or reference book.

Quantum Computation and Quantum Information - Michael A. Nielsen 2010-12-09

One of the most cited books in physics of all time, Quantum Computation and Quantum Information remains the best textbook in this exciting field of science. This 10th anniversary edition includes an introduction from the authors setting the work in context. This comprehensive textbook describes such remarkable effects as fast quantum algorithms, quantum teleportation, quantum cryptography and quantum error-correction. Quantum mechanics and computer science are introduced before moving on to describe what a quantum computer is, how it can be used to solve problems faster than 'classical' computers and its real-world implementation. It concludes with an in-depth treatment of quantum information. Containing a wealth of figures and exercises, this well-known textbook is ideal for courses on the subject, and will interest beginning graduate students and researchers in physics, computer science, mathematics, and electrical engineering.

Applications of Evolutionary Computing - Mario Giacobini 2008-03-14
This book constitutes the refereed joint proceedings of eight European workshops on the Theory and Applications of Evolutionary Computation, EvoWorkshops 2008, held in Naples, Italy, in March 2008 within the scope of the EvoStar 2008 event. The 57 revised full papers and 18 revised short papers presented were carefully reviewed and selected from a total of 133 submissions. In accordance with the eight workshops covered, the papers are organized in topical sections on application of nature-inspired techniques to telecommunication networks and other connected systems, evolutionary computation in finance and economics, bio-inspired heuristics for design automation, evolutionary computation in image analysis and signal processing, evolutionary and biologically

inspired music, sound, art and design, bio-inspired algorithms for continuous parameter optimization, evolutionary algorithms in stochastic and dynamic environments, theory and applications of evolutionary computation, and on evolutionary computation in transportation and logistics.

Network Practices - Anthony Burke 2012-03-20

The twin revolutions of the global economy and omnipresent Internet connectivity have had a profound impact on architectural design. Geographical gaps and, in many cases, architecture's tie to the built world itself have evaporated in the face of our new networked society. Form is now conceptualized by architects, engineers, and artists as reflexive, contingent, and distributed. The collected essays in Network Practices capture this unique moment in the evolution of design, where crossing disciplines, spatial interactions, and design practices are all poised to be reimagined. With contributions by architects, artists, computer programmers, and theorists and texts by Reinhold Martin, Dagmar Richter, Michael Speaks, and others, Network Practices offers an interdisciplinary analysis of how art, science, and architecture are responding to rapidly changing mobile, wireless, and information embedded environments

Technologies Shaping Instruction and Distance Education: New Studies and Utilizations - Syed, Mahbubur Rahman 2009-12-31

"This book covers the use of technology and the development of tools to support content exchange, delivery, collaboration and pedagogy used in distance education delivery"--Provided by publisher.

Encyclopedia of Human Geography - Barney Warf 2006-05-16

With more than 300 entries written by an international team of leading authorities in the field, the Encyclopedia of Human Geography offers a comprehensive overview of the major ideas, concepts, terms, and approaches that characterize a notoriously diverse field. This multidisciplinary volume provides cross-cultural coverage of human geography as it is understood in the contemporary world and takes into account the enormous conceptual changes that have evolved since the 1970s, including a variety of social constructivist approaches.

Scientific Discovery - Pat Langley 1987

Scientific discovery is often regarded as romantic and creative--and hence unanalyzable--whereas the everyday process of verifying discoveries is sober and more suited to analysis. Yet this fascinating exploration of how scientific work proceeds argues that however sudden the moment of discovery may seem, the discovery process can be described and modeled. Using the methods and concepts of contemporary information-processing psychology (or cognitive science) the authors develop a series of artificial-intelligence programs that can simulate the human thought processes used to discover scientific laws. The programs--BACON, DALTON, GLAUBER, and STAHL--are all largely data-driven, that is, when presented with series of chemical or physical measurements they search for uniformities and linking elements, generating and checking hypotheses and creating new concepts as they go along. *Scientific Discovery* examines the nature of scientific research and reviews the arguments for and against a normative theory of discovery; describes the evolution of the BACON programs, which discover quantitative empirical laws and invent new concepts; presents programs that discover laws in qualitative and quantitative data; and ties the results together, suggesting how a combined and extended program might find research problems, invent new instruments, and invent appropriate problem representations. Numerous prominent historical examples of discoveries from physics and chemistry are used as tests for the programs and anchor the discussion concretely in the history of science.

Molecular Marketing. Market Leadership Creative Modeling - Iveta Merlinova 2015

Bio-Inspired Artificial Intelligence - Dario Floreano 2008-08-22

A comprehensive introduction to new approaches in artificial intelligence and robotics that are inspired by self-organizing biological processes and structures. New approaches to artificial intelligence spring from the idea that intelligence emerges as much from cells, bodies, and societies as it does from evolution, development, and learning. Traditionally, artificial

intelligence has been concerned with reproducing the abilities of human brains; newer approaches take inspiration from a wider range of biological structures that are capable of autonomous self-organization. Examples of these new approaches include evolutionary computation and evolutionary electronics, artificial neural networks, immune systems, biorobotics, and swarm intelligence—to mention only a few. This book offers a comprehensive introduction to the emerging field of biologically inspired artificial intelligence that can be used as an upper-level text or as a reference for researchers. Each chapter presents computational approaches inspired by a different biological system; each begins with background information about the biological system and then proceeds to develop computational models that make use of biological concepts. The chapters cover evolutionary computation and electronics; cellular systems; neural systems, including neuromorphic engineering; developmental systems; immune systems; behavioral systems—including several approaches to robotics, including behavior-based, bio-mimetic, epigenetic, and evolutionary robots; and collective systems, including swarm robotics as well as cooperative and competitive co-evolving systems. Chapters end with a concluding overview and suggested reading.

A-Life for Music - Eduardo Reck Miranda 2011-01-01

Artificial Life, or A-Life, aims at the study of all phenomena characteristic of natural living systems, through computational modeling, wetware-hardware hybrids, and other artificial media. Its scope ranges from the investigation of the emergence of cognitive processes in natural or artificial systems to the development of life or life-like properties from inorganic components. A number of musicians, in particular composers and musicologists, have started to turn to A-Life for inspiration and working methodology. This edited volume features thirteen chapters written by researchers and practitioners in this exciting emerging field of computer music, and includes a CD with various examples music related to A-Life.

Computers and Creativity - Jon McCormack 2012-08-21

This interdisciplinary volume introduces new theories and ideas on

creativity from the perspectives of science and art. Featuring contributions from leading researchers, theorists and artists working in artificial intelligence, generative art, creative computing, music composition, and cybernetics, the book examines the relationship between computation and creativity from both analytic and practical perspectives. Each contributor describes innovative new ways creativity can be understood through, and inspired by, computers. The book tackles critical philosophical questions and discusses the major issues raised by computational creativity, including: whether a computer can exhibit creativity independently of its creator; what kinds of creativity are possible in light of our knowledge from computational simulation, artificial intelligence, evolutionary theory and information theory; and whether we can begin to automate the evaluation of aesthetics and creativity in silico. These important, often controversial questions are contextualised by current thinking in computational creative arts practice. Leading artistic practitioners discuss their approaches to working creatively with computational systems in a diverse array of media, including music, sound art, visual art, and interactivity. The volume also includes a comprehensive review of computational aesthetic evaluation and judgement research, alongside discussion and insights from pioneering artists working with computation as a creative medium over the last fifty years. A distinguishing feature of this volume is that it explains and grounds new theoretical ideas on creativity through practical applications and creative practice. Computers and Creativity will appeal to theorists, researchers in artificial intelligence, generative and evolutionary computing, practicing artists and musicians, students and any reader generally interested in understanding how computers can impact upon creativity. It bridges concepts from computer science, psychology, neuroscience, visual art, music and philosophy in an accessible way, illustrating how computers are fundamentally changing what we can imagine and create, and how we might shape the creativity of the future. Computers and Creativity will appeal to theorists, researchers in artificial intelligence, generative and evolutionary computing, practicing artists and musicians, students and any reader

generally interested in understanding how computers can impact upon creativity. It bridges concepts from computer science, psychology, neuroscience, visual art, music and philosophy in an accessible way, illustrating how computers are fundamentally changing what we can imagine and create, and how we might shape the creativity of the future.

An Introduction to Kolmogorov Complexity and Its Applications - Ming Li 2013-03-09

Briefly, we review the basic elements of computability theory and probability theory that are required. Finally, in order to place the subject in the appropriate historical and conceptual context we trace the main roots of Kolmogorov complexity. This way the stage is set for Chapters 2 and 3, where we introduce the notion of optimal effective descriptions of objects. The length of such a description (or the number of bits of information in it) is its Kolmogorov complexity. We treat all aspects of the elementary mathematical theory of Kolmogorov complexity. This body of knowledge may be called algorithmic complexity theory. The theory of Martin-Lof tests for randomness of finite objects and infinite sequences is inextricably intertwined with the theory of Kolmogorov complexity and is completely treated. We also investigate the statistical properties of finite strings with high Kolmogorov complexity. Both of these topics are eminently useful in the applications part of the book. We also investigate the recursion theoretic properties of Kolmogorov complexity (relations with Godel's incompleteness result), and the Kolmogorov complexity version of information theory, which we may call "algorithmic information theory" or "absolute information theory." The treatment of algorithmic probability theory in Chapter 4 presupposes Sections 1.6, 1.11.2, and Chapter 3 (at least Sections 3.1 through 3.4).

Artificial Intelligence and Knowledge Engineering Applications: A Bioinspired Approach - José Mira 2005-06-13

The two-volume set LNCS 3561 and LNCS 3562 constitute the refereed proceedings of the First International Work-Conference on the Interplay between Natural and Artificial Computation, IWINAC 2005, held in Las Palmas, Canary Islands, Spain in June 2005. The 118 revised papers presented are thematically divided into two volumes; the first includes all

the contributions mainly related with the methodological, conceptual, formal, and experimental developments in the fields of Neurophysiology and cognitive science. The second volume collects the papers related with bioinspired programming strategies and all the contributions related with the computational solutions to engineering problems in different application domains.

Turing's Connectionism - Christof Teuscher 2012-12-06

Christof Teuscher revives, analyzes, and simulates Turing's ideas, applying them to different types of problems, and building and training Turing's machines using evolutionary algorithms. In a little known paper entitled 'Intelligent Machinery' Turing investigated connectionist networks, but his work was dismissed as a 'schoolboy essay' and it was left unpublished until 1968, 14 years after his death. This is not a book about today's (classical) neural networks, but about the neuron network-like structures proposed by Turing. One of its novel features is that it actually goes beyond Turing's ideas by proposing new machines. The book also contains a Foreward by B. Jack Copeland and D. Proudfoot.

Nature-Inspired Algorithms for Optimisation - Raymond Chiong
2009-04-28

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.

Fundamentals of Natural Computing - Leandro Nunes de Castro
2006-06-02

Natural computing brings together nature and computing to develop new computational tools for problem solving; to synthesize natural patterns and behaviors in computers; and to potentially design novel types of computers. *Fundamentals of Natural Computing: Basic Concepts, Algorithms, and Applications* presents a wide-ranging survey of novel techniques and important applications of nature-based computing. This book presents theoretical and philosophical discussions, pseudocodes for algorithms, and computing paradigms that illustrate how computational techniques can be used to solve complex problems, simulate nature, explain natural phenomena, and possibly allow the development of new computing technologies. The author features a consistent and approachable, textbook-style format that includes lucid figures, tables, real-world examples, and different types of exercises that complement the concepts while encouraging readers to apply the computational tools in each chapter. Building progressively upon core concepts of nature-inspired techniques, the topics include evolutionary computing, neurocomputing, swarm intelligence, immunocomputing, fractal geometry, artificial life, quantum computing, and DNA computing. *Fundamentals of Natural Computing* is a self-contained introduction and a practical guide to nature-based computational approaches that will find numerous applications in a variety of growing fields including engineering, computer science, biological modeling, and bioinformatics.

Modeling Complex Systems - Nino Boccara 2010-09-09

This book illustrates how models of complex systems are built up and provides indispensable mathematical tools for studying their dynamics. This second edition includes more recent research results and many new and improved worked out examples and exercises.

Engineering Mathematics with Examples and Applications - Xin-She Yang 2016-12-29

Engineering Mathematics with Examples and Applications provides a compact and concise primer in the field, starting with the foundations, and then gradually developing to the advanced level of mathematics that

is necessary for all engineering disciplines. Therefore, this book's aim is to help undergraduates rapidly develop the fundamental knowledge of engineering mathematics. The book can also be used by graduates to review and refresh their mathematical skills. Step-by-step worked examples will help the students gain more insights and build sufficient confidence in engineering mathematics and problem-solving. The main approach and style of this book is informal, theorem-free, and practical. By using an informal and theorem-free approach, all fundamental mathematics topics required for engineering are covered, and readers can gain such basic knowledge of all important topics without worrying about rigorous (often boring) proofs. Certain rigorous proof and derivatives are presented in an informal way by direct, straightforward mathematical operations and calculations, giving students the same level of fundamental knowledge without any tedious steps. In addition, this practical approach provides over 100 worked examples so that students can see how each step of mathematical problems can be derived without any gap or jump in steps. Thus, readers can build their understanding and mathematical confidence gradually and in a step-by-step manner. Covers fundamental engineering topics that are presented at the right level, without worry of rigorous proofs Includes step-by-step worked examples (of which 100+ feature in the work) Provides an emphasis on numerical methods, such as root-finding algorithms, numerical integration, and numerical methods of differential equations Balances theory and practice to aid in practical problem-solving in various contexts and applications

Handbook of Computational Economics - Leigh Tesfatsion 2006-05-15
The explosive growth in computational power over the past several decades offers new tools and opportunities for economists. This handbook volume surveys recent research on Agent-based Computational Economics (ACE), the computational study of economic processes modeled as dynamic systems of interacting agents. Empirical referents for "agents" in ACE models can range from individuals or social groups with learning capabilities to physical world features with no cognitive function. Topics covered include: learning; empirical validation; network

economics; social dynamics; financial markets; innovation and technological change; organizations; market design; automated markets and trading agents; political economy; social-ecological systems; computational laboratory development; and general methodological issues. *Every volume contains contributions from leading researchers *Each Handbook presents an accurate, self-contained survey of a particular topic *The series provides comprehensive and accessible surveys

Nature-Inspired Metaheuristic Algorithms - Xin-She Yang 2008
Modern metaheuristic algorithms such as bee algorithms and harmony 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 in optimization, including genetic algorithms, bee algorithms, particle swarm optimization, simulated annealing, ant colony optimization, harmony search, and firefly algorithms. We also briefly introduce the photosynthetic algorithm, the enzyme algorithm, and Tabu search. 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 some of the algorithms such as the harmony search and firefly algorithms are at the forefront of current research, this book can also serve as a reference book for researchers.

Emergence in Interactive Art - Jennifer Seevinck 2017-03-28
This book is concerned with emergence, interaction, art and computing. It introduces a new focus for emergence in interactive art: the emergent experience. Emergence literature is discussed and an organising framework, the Taxonomy of Emergence in Interactive Art (TEIA) is provided together with case studies of digital, interactive art systems that facilitate emergence. Evidence from evaluations of people interacting with the works is analysed using the TEIA. Artworks from across the world are also reviewed to further illustrate the potential for emergence. Interactive art is, itself, still a young domain where audience influence, or interaction with the work is a defining aspect. Emergence in

Interactive Art explores the rich opportunities for interactive experiences of digital art systems that are provided by looking through a 'lens' of emergence. And what better way to explore these potentials than through the open-ended domain of emergence, with its inherent affinity to the natural world? Through an integrated approach of practice, research and theory this book reveals design and analytical insights relating to emergence, interaction and interactive art to benefit artists, researchers and designers alike.

Computational Complexity - Sanjeev Arora 2009-04-20

New and classical results in computational complexity, including interactive proofs, PCP, derandomization, and quantum computation. Ideal for graduate students.

The Algorithmic Beauty of Plants - Przemyslaw Prusinkiewicz
2012-12-06

Now available in an affordable softcover edition, this classic in Springer's acclaimed Virtual Laboratory series is the first comprehensive account of the computer simulation of plant development. 150 illustrations, one third of them in colour, vividly demonstrate the spectacular results of the algorithms used to model plant shapes and developmental processes. The latest in computer-generated images allow us to look at plants growing, self-replicating, responding to external factors and even mutating, without becoming entangled in the underlying mathematical formulae involved. The authors place particular emphasis on Lindenmayer systems - a notion conceived by one of the authors, Aristid Lindenmayer, and internationally recognised for its exceptional elegance in modelling biological phenomena. Nonetheless, the two authors take great care to present a survey of alternative methods for plant modelling.

The Human Mind through the Lens of Language - Nirmalangshu Mukherji 2022-06-30

Most living forms in nature display various cognitive abilities in their behaviour. However, except for humans, no other animal builds fires and wheels, navigates with maps and tells stories to other conspecifics. We can witness this unique feature of the human mind in almost everything humans do, such as painting, singing and cooking; there is an underlying

sense of unity in the generative part of these systems despite wide differences in what they are about. This book introduces, defends and develops a novel philosophical approach to the study of the generative mind. Nirmalangshu Mukherji argues for a single, species-specific generative principle that accounts for the human ability to combine symbolic forms without bound in each domain that falls under the generative mind.

The Shape of Algebra in the Mirrors of Mathematics - Gabriel Katz 2012
The Shape of Algebra is the authors' attempt to share their mathematical experiences with readers who have more than a passing interest in mathematics, but have only a traditional exposure to elementary algebra. Secondary school and college teachers and students who want to expand their horizons in the field will find a fresh presentation of familiar concepts and some unexpected results. This book serves as a text for an "appreciation" course in modern mathematics designed for non-mathematics majors or for first-year students who are considering the possibility of studying mathematics or related disciplines. It can also serve as a source of computer-supported activities that could supplement traditional courses in algebra, multivariable calculus, and complex variable. This book gives the reader a sense of the visual nature of mathematics. Mathematical experiments with universal mapping software VisuMatica, designed by Vladimir Nodel'man, form the very core of the book. Readers are encouraged to reproduce, play with, and expand on these experiments. Numerous problems are interspersed throughout the text to guide the reader. Our treatment of standard algebra is visual and computational. By introducing visual computational environments like VisuMatica, our book promotes this geometric approach to algebra and makes it accessible to readers a great deal earlier. The book will enable our readers to approach its content on three levels: the first one which requires only some fluency with elementary algebraic manipulations; the second one which also presumes familiarity with the notions of derivatives and tangent lines to plane curves, and the third one which uses some basic concepts of multivariable calculus. All three levels are clearly marked in the text, and will allow for a smooth

reading and virtual experiments, regardless of the level that our readers will find comfortable.

Contemporary Studies in Environmental and Indigenous Pedagogies - Andrejs Kulnieks 2013-06-13

Contemporary Studies in Environmental and Indigenous Pedagogies: A Curricula of Stories and Place. Our book is a compilation of the work of experienced educational researchers and practitioners, all of whom currently work in educational settings across North America. Contributors bring to this discussion, an enriched view of diverse ecological perspectives regarding when and how contemporary environmental and Indigenous curriculum figures into the experiences of curricular theories and practices. This work brings together theorists that inform a cultural ecological analysis of the environmental crisis by exploring the ways in which language informs ways of knowing and being as they outline how metaphor plays a major role in human relationships with natural and reconstructed environments. This book will be of interest to educational researchers and practitioners who will find the text important for envisioning education as an endeavour that situates learning in relation to and informed by an Indigenous Environmental Studies and Eco-justice Education frameworks. This integrated collection of theory and practice of environmental and Indigenous education is an essential tool for researchers, graduate and undergraduate students in faculties of education, environmental studies, social studies, multicultural education, curriculum theory and methods, global and comparative education, and women's studies. Moreover, this work documents methods of developing ways of implementing Indigenous and Environmental Studies in classrooms and local communities through a framework that espouses an eco-ethical consciousness. The proposed book is unique in that it offers a wide variety of perspectives, inviting the reader to engage in a broader conversation about the multiple dimensions of the relationship between ecology, language, culture, and education in relation to the cultural roots of the environmental crisis that brings into focus the local and global commons, language and identity, and environmental justice through

pedagogical approaches by faculty across North America who are actively teaching and researching in this burgeoning field.

Signal Processing Techniques for Computational Health Informatics - Md Atiqur Rahman Ahad 2020-10-07

This book focuses on signal processing techniques used in computational health informatics. As computational health informatics is the interdisciplinary study of the design, development, adoption and application of information and technology-based innovations, specifically, computational techniques that are relevant in health care, the book covers a comprehensive and representative range of signal processing techniques used in biomedical applications, including: bio-signal origin and dynamics, sensors used for data acquisition, artefact and noise removal techniques, feature extraction techniques in the time, frequency, time-frequency and complexity domain, and image processing techniques in different image modalities. Moreover, it includes an extensive discussion of security and privacy challenges, opportunities and future directions for computational health informatics in the big data age, and addresses the incorporation of recent techniques from the areas of artificial intelligence, deep learning and human-computer interaction. The systematic analysis of the state-of-the-art techniques covered here helps to further our understanding of the physiological processes involved and expandour capabilities in medical diagnosis and prognosis. In closing, the book, the first of its kind, blends state-of-the-art theory and practices of signal processing techniques inthe health informatics domain with real-world case studies building on those theories. As a result, it can be used as a text for health informatics courses to provide medics with cutting-edge signal processing techniques, or to introducehealth professionals who are already serving in this sector to some of the most exciting computational ideas that paved the way for the development of computational health informatics.

Designing Beauty: The Art of Cellular Automata - Andrew Adamatzky 2016-01-05

This fascinating, colourful book offers in-depth insights and first-hand working experiences in the production of art works, using simple

computational models with rich morphological behaviour, at the edge of mathematics, computer science, physics and biology. It organically combines ground breaking scientific discoveries in the theory of computation and complex systems with artistic representations of the research results. In this appealing book mathematicians, computer scientists, physicists, and engineers brought together marvelous and esoteric patterns generated by cellular automata, which are arrays of simple machines with complex behavior. Configurations produced by cellular automata uncover mechanics of dynamic patterns formation, their propagation and interaction in natural systems: heart pacemaker, bacterial membrane proteins, chemical reactors, water permeation in soil, compressed gas, cell division, population dynamics, reaction-diffusion media and self-organisation. The book inspires artists to take on cellular automata as a tool of creativity and it persuades scientists to convert their research results into the works of art. The book is lavishly illustrated with visually attractive examples, presented in a lively and easily accessible manner.

Chaos, Fractals, and Dynamics - Robert L. Devaney 1990

Introduces the mathematical topics of chaos, fractals, and dynamics using a combination of hands-on computer experimentation and precalculus mathematics. A series of experiments produce fascinating computer graphics images of Julia sets, the Mandelbrot set, and fractals. The basic ideas of dynamics--chaos, iteration, and stability--are illustrated via computer projects.

GeoComputation, Second Edition - Robert J. Abrahart 2014-06-23

A revision of Openshaw and Abrahart's seminal work, GeoComputation, Second Edition retains influences of its originators while also providing updated, state-of-the-art information on changes in the computational environment. In keeping with the field's development, this new edition takes a broader view and provides comprehensive coverage across the field of GeoComputation. See What's New in the Second Edition: Coverage of ubiquitous computing, the GeoWeb, reproducible research, open access, and agent-based modelling Expanded chapter on Genetic Programming and a separate chapter developed on Evolutionary Algorithms Ten chapters updated by the same or new authors and eight new chapters added to reflect state of the art Each chapter is a stand-alone entity that covers a particular topic. You can simply dip in and out or read it from cover to cover. The opening chapter by Stan Openshaw has been preserved, with only a limited number of minor essential modifications having been enacted. This is not just a matter of respect. Openshaw's work is eloquent, prophetic, and his overall message remains largely unchanged. In contrast to other books on this subject, GeoComputation: Second Edition supplies a state-of-the-art review of all major areas in GeoComputation with chapters written especially for this book by invited specialists. This approach helps develop and expand a computational culture, one that can exploit the ever-increasing richness of modern geographical and geospatial datasets. It also supplies an instructional guide to be kept within easy reach for regular access and when need arises.